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Illumination of Four Color Presses in Printing Plant of Sears, Roebuck & Company, Chicago. Special Mazda Lighting Equipment Used for Reproducing True Daylight Tints.

The Lighting of Printing and Book-Binding Plants

Importance of Best Possible Lighting to the Printer—General Features of Lighting Problem and Suggestions for Effective Illumination of Principal Departments

By F. H. BERNHARD

This is the fifth of a series of twelve articles on improvement of lighting in as many industries. These articles emphasize the desirability of improving industrial lighting to meet present heavy demands and those to come after the war. The benefits of better lighting are set forth in a non-technical way so they may be brought to the attention of factory owners, managers and superintendents, very many of whom still have but an imperfect realization of the importance of good illumination to their industries.

THE printed word is becoming an increasingly potent factor in the enlightenment of the world. There are many limitations to the spoken and the written word. The printer's art, however, enables the author and the editor to bring their ideas quickly, economically and in permanently recorded form to thousands of people in various parts of the world. Fulfilling so important a function in the dissemination of knowledge, it is not surprising that printing has progressed rapidly, especially in the last half century. From crude beginnings with hand-carved type and hand presses, extraordinary development has been brought about to the present typesetting machine and the modern high-speed newspaper perfecting press.

As in other industries, the use of machinery has speeded up and cheapened the printer's product. The more intensive production thus made possible has in turn necessitated greater attention to shop layout, ventilation and lighting to permit the men to work under the most favorable conditions, for if they are handi-

capped in doing their work most efficiently, the high productive capacity of expensive machinery is largely lost. Since so many of the printing processes call for close visual work, it is fortunate that the importance of providing the best possible lighting is becoming recognized.

However, this recognition has been given so far only by the progressive printers, who are giving much thought to the subject, as is evident in visiting the most modern and, usually, the largest shops. As a rule, the small and the old print shops are as backward in their lighting as in ventilation and general arrangement. This is due in a great measure to location in old, ramshackle buildings with small, dirty windows, dark walls and ceilings, and promiscuously arranged type cases, linotype machines, make-up stones, presses, etc. Such shops remind one of the antiquated days when the printery was one of the dingy rooms in the master printer's home and when all of the work was done by hand under the most adverse conditions. Obviously, these backward shops are the ones most in need of assistance from the lighing specialist.

Importance of Good Light for Accurate, Neat and Quick Work.

The keen competition in the printing industry is based on service as well as price, and the printer who can render superior service can command a better price. Service in printing involves chiefly accurate, neat and quick work. Each of these requires excellent illumination. Little argument is needed to show that abundant and properly directed light is necessary for accuracy in setting type, proofreading, making up of pages and forms, and is likewise necessary for neat and pleasing make-up and press work. It is not generally realized, however, even by the men themselves, that improvement in lighting results in materially reducing such common compositor's mistakes as transposed letters and otherwise misspelt words, omissions or repetitions, as well as errors due to inability to decipher poorly written manuscript or "copy." The proofreaders often have the double difficulty of reading poor copy and poor galley proofs, which can be greatly ameliorated by good illumination. The make-up man can, and does, make many mistakes because of inadequate or improper lighting. Printers are coming to realize that mistakes represent much loss of money, time and prestige, but they do not generally know that better lighting is a splendid investment on the score of minimizing errors and revision, and of improving the quality of the work generally.

The neatness of a piece of printed work depends not only on the kind and size of type used, but also on its general arrangement and spacing, the details of which are largely left to the printer. While this involves an artistic sense, it also involves good illumination so that the details of the make-up can be observed as well as the entire effect. These matters should be attended to on the stones so that the pressmen need take care only of mechanical details that cannot be detected until the forms reach the "make-ready" stage on the presses. Here also there is need for ample light, else the blemishes in the presswork will be allowed to pass.

Delays in any of the various stages of composition, make-up, presswork and binding usually spell the difference between profit and loss. It is readily seen that excessive revisions of galleys or pages represent not only lost time but needless cost. In a great many cases this should be charged against poor lighting,

Printing Department of an Electric Lamp Company, Showing How a Small Shop Can be Excellently and Economically Lighted. Semi-Indirect Lighting With Mazda Lamps.

Make-up Stones in Regan Printing House, Chicago. Copious Illumination of Spaces Around Stones as Well as Surface. Steel Enameled Reflectors Used With Mazda Lamps.

which is really to blame. Printers do not appreciate, however, to what a large extent every detail of the constant visual work done by compositor, proofreader, "stone" man and pressman is dependent on lighting. If, due to poor lighting conditions, a linotype operator has continuously to strain his eyes and thereby loses only a minute in setting each galley of type, he loses quite a few minutes a day which loss can be entirely obviated by improvement in lighting at comparatively trivial expense. In fact, the entire cost of lighting for the whole day is equivalent to only a few minutes of the compositor's wages. Similar saving of needlessly wasted time can be effected on the part of the other workmen.

An idea of this loss can be obtained from the recent statement of the superintendent of a large, modern printing plant who has given much thought and study to the subject of lighting and fully appreciates its importance after extended experimentation with various lighting systems and arrangements. After equipping his new building along the most advanced lines he found that the general efficiency of the men was improved at least 25 per cent. This was due chiefly to doing their work more easily and with less visual effort, so that there are eliminated the countless small time losses that occur throughout the day where there is constant eye strain; a few seconds or even a minute or more here and there can easily amount to one or more hours a day. Moreover, the reduction of errors and revisions already referred to means considerable added saving of time. The particularly favorable feature of the whole matter is that the reduction of these avoidable time losses, which in effect result in a general speeding up, are brought about without consciously intensified application by the workmen.

Printers as a whole, and especially compositors, are somewhat above the average class of workmen intellectually. Working continually with the eye and brain as well as with the hands, they are more given to logical reasoning; they are also more sensitive to working conditions and appreciative of their improvement. Improved lighting means not only better visual conditions but also a more cheerful workroom, which has an important influence on the spirits and contentment of the workers.

Another advantage resulting from modern lighting is the decided reduction of accidents. Industrial accidents for the country as a whole and for all industries are found to be due to the extent of some 25 per cent to inadequate or otherwise poor lighting. They occur chiefly in the winter months when the scantiness of daylight compels greater reliance on artificial lighting. If the latter were as well distributed and approximated the intensity of daylight illumination, the increase of accidents in winter would be materially diminished.

In the printing trade accidents are by no means as prevalent as in many other more hazardous occupations, but it is unfortunately not rare that an apprentice has his hand hurt in a Gordon press, a founder his foot burned when recasting type metal, or a pressman his leg injured by the slipping of a heavy form or roll of paper he may be trucking. Many a serious fall is also caused by stumbling over obstructions in dark aisles or passageways or unlighted stairways. All such accidents can be reduced considerably over 25 per cent, since good lighting promotes safety in trucking or even walking about the plant, as it does every operation. A British Government factory investigation report showed that over 71 per cent of falls on stairways were due to poor lighting.

Still another benefit obtained from improved lighting is its exposure of insanitary conditions, which usually are allowed to exist because not detected in poorly lighted parts of the establishment. It must be remembered that the sickness rate among printers is very high, especially as to tuberculosis and lead poisoning. While the former is due largely to poor ventilation, it is also directly promoted by promiscuous ex-

pectoration. Good lighting makes it unlikely that obscure corners will be converted into filthy spit spots or that the cuspidors actually provided will be neglected. It also insures that insanitary conditions in toilet and wash rooms will at least be exposed to the foreman, superintendent or other person responsible for their continuance.

General Features of Print-shop Lighting Problem.

In the foregoing a brief review has been made of the principal features that make the best possible lighting necessary for the printer and the special advantages he can gain therefrom. The importance of considering the lighting has been made clear, so that it is desirable now to turn to the general aspects of the problem. It is self-evident that the printshop should be located in premises that provide copious daylight, either through ample windows or preferably sawtooth roof construction giving north-sky daylight. In a new building this can usually be provided for, but in leased quarters there is less choice in the matter and it is usually necessary to make up for deficiency in daylight by liberal provision for artificial light. Before discussing the latter, it may be mentioned that both natural and artificial lighting are enhanced as to efficiency and distribution by bright walls and ceilings. Plenty of whitewash or calcimine frequently applied also helps to make the rooms cheerful and sanitary.

Regardless of the excellence of daylight conditions there are few printing plants that can depend on it alone, because it is too uncertain. A print shop cannot afford to shut down or curtail its work every time a cloudy day develops. Even in sunny California or Arizona the investment in a printing plant with expensive typesetting machines and presses is too large to be idle during the long winter nights. Besides, the need for frequent rush work necessitates overtime or even running with two shifts. Progressive printers now realize that in the composing and pressrooms the income from the large investment is practically doubled by night work. The former objection to this was due very largely to the meagerness of the artificial light available. However, lighting developments have been so marked in the last ten years or so that artificial light can now be provided efficiently, that is fully the equal of, and in some cases superior to, the daylight available in most shop interiors.

Printing plants can be divided into various classes, according to the amount and kind of work done, and the lighting requirements of the different classes vary considerably. For instance, small job printing shops, plants handling weekly periodicals, and large city newspapers have quite different lighting problems. It is therefore difficult to lay down general rules that can apply in all cases. Furthermore, the number of printing plants of such size as to have an entire floor for each department is comparatively very small; the average print shop has only a small portion of one floor devoted to linotype machines, another portion to hand-composition cases, another to proofreaders' tables, to make-up stones, etc. The lighting problems of these different sections are usually looked upon as radically different. They do somewhat differ, but not to the extent that has been held. It is because of these apparently conflicting requirements that some lighting men used to laying out practically an entire floor as a single problem are prone to throw up their hands in despair and, instead of making suggestions based on experience and judgment, install such miscellaneous equipment as meets the fancy of the different foremen or gang bosses.

There are several principles of good lighting that can be applied generally throughout a plant with little modification of equipment. These may be listed as follows:

1. Abundant illumination intensity and direction of light to carry on the work without special visual effort or strain.

2. Location and equipment of light sources so that glare from light shining directly into the eye will be minimized.

3. Reasonably uniform illumination distribution and avoidance of sharp shadows.

4. Preference for general instead of localized lighting and use of latter only to supplement the former

Part of the Composing and Proofreading Room in Sears, Roebuck & Company's Printing Plant. Liberal Use of Localized Lighting Supplemented by General Lighting With Mazda Lamps and Prismatic Reflectors.

Catalog Binding Department, Sears, Roebuck & Company. A Busy Room Where Good Night Work Is Made Possible by Effective Illumination From Mazda Lamps With Porcelain Enameled Steel Reflectors.

where absolutely necessary for proper visual work.

These principles have been found by experience to apply in practically all industrial lighting where excellent illumination is obtained. They set forth requirements that overlap and can be briefly combined in the following: Abundant light, well directed, diffused and distributed. As to the abundance of the light, this will be referred to below in discussing specific suggestions for the principal operations of the printing shop. As to direction of the light, it must in the first place be such that the workman does not cast a shadow over his work; secondly, it should be directed so that the light is not exclusively downward but also illuminates the side and vertical surface of such machinery as presses, saws, gathering, binding and trimming machines, and thirdly, so that it is not reflected into the eye from polished or glazed surfaces and so that normally it does not shine into the eye directly from the light source.

If these last requirements are overlooked there results the objectionable glare from the high intrinsic brilliancy of lamp filaments. Modern lamps are very efficient, but their filaments are extremely brilliant and, if special means are not taken to diffuse the direct light from the source or to mount the lamps so high that the filament cannot ordinarily be seen, the glare is likely to be blinding. This interferes with vision both by compelling partial closing of the iris and by destructive action on the retina. There is little excuse for allowing glaring conditions to exist. By use of a frosted lamp, diffusing bowl, band or cup, or by application of an opaque reflecting cap to the tip of the lamp the glare from the filament is eliminated or diminished to an unobjectionable amount. In no case should a bare lamp be used even when hung high. It is inefficient and the worst example of a glaring source. Use of a proper reflector directs the light usefully and at the same time cuts off the glare to a large extent.

High mounting of lamps is desirable for this reason and also because it widens the area lighted and decreases the likelihood of having contrasting dark and bright spots, that is, it makes the light distribution much more uniform. Deep shadows and great contrasts of light and dark areas are very trying to the adaptation muscles of the eye and therefore bring about needless eye fatigue. They are also responsible for numerous accidents.

Summarizing the preceding discussion, it may be said that the use of general lighting from lamps well equipped with reflectors and hung quite high meets the requirements for satisfactory illumination very well and overcomes the many serious objections to drop cords and other localized lighting. In fact, with the few exceptions to be referred to below, it can be used for supplying all the light needed in the printing shop; even in those sections where localized lighting is necessary it should be supplemented by general lighting to remove the gloom otherwise noticeable in the portions of the room not directly illuminated by the local lamps.

There are numerous other objections to the use of drop cords. Among them is the severe wear and tear that the cords themselves, the sockets, shade-holders and reflectors receive when they are accessible to continual adjustment by the worker. The result is that very soon a dilapidated appearance is presented by the entire installation unless exceptionally good maintenance is provided. Such maintenance is necessarily expensive, however, and the entire system of drop cords is much less efficient than an installation of general lighting from lamps mounted close to the ceiling. Moreover, when a lamp burns out the accessibility of other lamps results in replacing the missing bulb by bulbs from other fixtures, in many cases are too large for the reflector. Drop cords should, therefore, not be used if there is any way of eliminating them by the use of the much more satisfactory system of general lighting. Where local lighting is necessary the equipment must be of the most rugged type and the wire of special reinforced cord.

Reference was made in a preceding paragraph to the need of abundant lighting. This depends upon the character of the visual work done and in the following table are given suggested values for illumination in-

tensities in foot-candles at the work. A foot-candle is the illumination on a surface 1 foot away from a lamp that gives one candlepower in every direction. This table of values in each case gives a range of several intensities to choose from because different conditions require different lighting intensities for substantially the same operation, for instance, where the ceilings and walls are dark in one case and bright in another, and again where the work in hand involves the use of the smaller types, where the lighting conditions are more severe the higher intensity should in all cases be chosen. The values given are also somewhat higher than those usually heretofore suggested for printing plants. These higher values are recommended, however, because the improved efficiency of modern lamps permits a higher intensity of illumination for the same cost that was formerly obtained from less efficient units. It is felt that on account of the close visual work done in most of the operations in a printing house it is almost impossible to get too much light. Certainly we are still a great way from equaling the intensities prevailing by daylight.

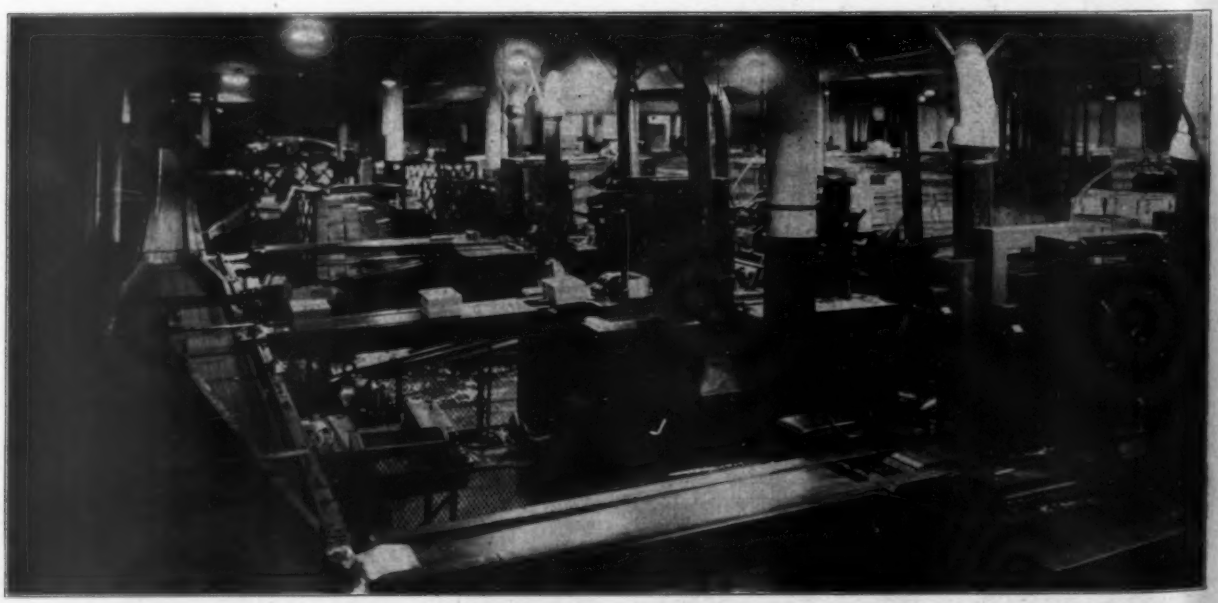
Kind of Work.	Foot-Candles at Work.
Typesetting machines	10 to 20
Hand composition	8 to 15
Proofreading	6 to 10
Make-up stones	10 to 18
Stereotyping	3 to 5
Gordon presses	4 to 6
Cylinder presses	5 to 8
Webb perfecting presses	6 to 10
Color presses	8 to 15
Folding machines	2 to 4
Gathering machines	3 to 5
Binding machines	3 to 5
Trimming machines	5 to 8
Stock rooms	1 to 2
Passages, stairways, etc.	1 to 2

In the composing room, linotype and monotype machines are usually lighted locally. The operators insist on this lighting both in order to see the copy and the working parts of the machines more perfectly and also so they may concentrate their attention upon the working area that they are concerned with. As a rule, however, this is the only lighting provided and the aisles as well as the spaces between the machines are usually quite dark. This is an unfortunate state of affairs that should be remedied by at least a moderate amount of illumination. The contrast between the brightly illuminated parts and the surroundings is too great for the eye to adapt itself without some muscular strain. The general lighting provided should consist of relatively small lamps placed over the center of the aisle and opposite the spaces between the machines. These lamps need not be placed very closely, but they should throw enough light on the upper portion of the machine and the space all about it, as well as in the aisle proper, to remove the gloomy aspect usually found in the neighborhood of linotype machines.

Hand composition cases are also very commonly lighted by means of localized illumination and this can be made effective if exceptional care is used in providing suitable and substantial equipment and maintaining it properly. However, general lighting can take care of this matter very satisfactorily, as is shown in one of the accompanying illustrations. Not only is the number of lamps very much reduced in this way and larger and more efficient lamps used, but the light is much better distributed and, if the units are well placed, the spaces between the cases will receive ample light. By placing the lamps over the aisle instead of over the case proper it is possible to throw plenty of light upon the slides or drawers usually included in the lower portions of such type cases. Where localized lighting is used it has been found necessary in some cases to place special lamps directly below the ledge of the oblique working surface so as to light up the interior of any drawer or slide when it is pulled out. An example of this kind of lighting is shown in another view, in which it will be observed that there are numerous lamps provided for general illumination; however, are strangely seldom used.

The lighting of proofreading tables is not difficult. Although this is very frequently done by means of localized reading lamps, this method is not necessary since general lighting of very satisfactory character can easily be provided.

The illumination of make-up stones has been a troublesome matter in many cases. It is common practice to place a single lamp with reflector over the middle of each stone. While this gives good illumination over the surface of the form being worked upon, it leaves the space around the stone and the shelves below



Catalog Trimming Machines, Sears, Roebuck & Company. Safe and Speedy Trimming of Thick Books Being Done Under Good Night Illumination.

Two Views of "Before" and "After" the Lighting Equipment in the Composing Room of a Chicago Printing Establishment Was Modernized by the Use of Mirrored-Glass Reflectors and Mazda Lamps.

it almost entirely unlighted. Experimentation on the part of some printers has shown better results to be obtained by placing the lamps over the space between two adjoining stones and staggering the location in such a way as to light all the aisle spaces as well as the shelving below the stone.

In the press room, especially in the small printing shop, the use of localized lighting is altogether too common. What has already been said in regard to leaving of dark spaces around the machines applies particularly here, except that more possibilities for accidents are thereby introduced. Except in the case of small Gordon presses it is almost impossible to light a press of any size with a single lamp placed directly over it. The lamps should be well distributed so as to light all sides of the press as well as the feed table.

In the case of the very large presses handling newspapers or other web printing jobs it is necessary to provide not only abundant light above and all about the press by means of high mounted lamps equipped with proper reflectors, but also to place within the press a number of lamps, carefully guarded and wired in conduit, so as to illuminate the various essential interior parts of the press. It is also customary to provide a permanently connected extension cord of rugged type so that trouble can be quickly located in those portions of the press not illuminated in the way just described. In the case of newspaper composing rooms this is also customary in linotype machines, for which a red pilot-lamp signaling system is frequently provided to call the mechanic without a moment's delay to repair any trouble that has developed on the machine. This practice can very well be extended to moderate size printing houses because every minute that the machine is tied up means that much loss from an idle operator and expensive machine.

The increasing use of color work, which is a highly developed art in itself, calls for special lighting of the color presses used. In this work it is necessary to check very carefully the registering of the different colors and also to watch carefully how they blend. For this purpose it was formally the custom to work only by day, but here again this means leaving an expensive machine idle for many hours each day. By the use of lamps especially prepared for giving an almost exact reproduction of daylight color it is possible to continue the running of these presses at any hour of the day or night. An accompanying illustration shows four such presses in the catalog printing department of a large mail-order house. In this case

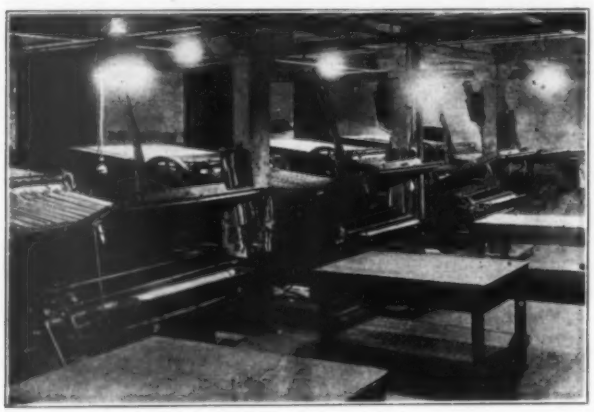
Hand Composition Cases in Regan Printing House, Chicago, Showing That General Illumination Can be Made More Satisfactory and Economical Than the Common Localized Lighting.

Cutting Department, Maryland Color Printing Company, Baltimore, Md. Trimming Machines Operating Under Excellent Artificial Lighting.

there are six 200-watt lamps arranged over the edges of the press and there are two lamps over an inspection table opposite the end. This lighting has been found very satisfactory, both from the color-matching and general illumination standpoints.

In the binding department the illumination does not have to be of so high an order as in pressrooms. Nevertheless, on account of the large use of machinery in binderies abundant light should be provided. This applies, of course, especially around and over each machine and particularly abundant lighting for the trimming machine where a man can easily have his fingers cut if the lighting is inadequate.

Space permits mentioning only a few other points, among which is the usual neglect of proper illumination of the stockroom. While the stockroom needs a relatively low order of illumination, this must be so arranged that the aisles in which trucking is done are well illuminated and they cannot be well illuminated by use of bare lamps that one commonly finds. These throw such glare in the eyes of the truckman that accidents in the handling of large bundles or rolls of paper can easily occur.



Cylinder Press Room, Maryland Color Printing Company, Baltimore, Md. Good Illumination From Mazda Lamps and Mirrored-Glass Reflectors.

In conclusion, it may be said again that the lighting of printing houses has been so sadly neglected up to the present time that it is worthy of most careful attention on the part of the master printer, his manager and superintendent. With the growing tendency toward increase in size and intensity of work in modern printing plants, it is altogether likely that the subject of lighting will receive the attention that it merits. Fortunately, there are quite a few of the large plants where this has already been done. A number of the accompanying illustrations show views in the printing department of one of the largest mail-order houses in the country. The equipment in this department, which is itself a gigantic plant, is of the most modern type and every detail, including the lighting, has been studied with exceptional care in order to decrease the operating costs and increase the output by utilizing the plant as nearly 24 hours a day as possible. Certainly, if the keen competition between printers is to continue, the subject of lighting printing houses must receive such attention.

SEATTLE SHORT OF POWER.

In recommending the renewal of the fuel contract between the city and the General Petroleum Company, Superintendent of Lighting J. D. Ross, of Seattle, advised the board of public works that increased load is falling on the Lake Union plant as the result of the demand on the Cedar Lake plant being in excess of its capacity. He stated that it would be necessary to close the Cedar Lake plant except during the peak load hours until November or December, when the heavy rains set in. The immense draft compels its shutdown during the greater part of the day in order to hold water enough to carry the plant at peak load hours. This means that the Lake Union plant of 20,000 kilowatts continuous capacity must carry about four-fifths of the power and the Cedar Lake plant one-fifth for the next few months. This means that the fuel oil demands will be increased to about 1000 barrels per day. The present price of oil is $1.65 per barrel and for the next 120 days $198,000 will be required to purchase oil alone. Demands of industrial concerns seeking to establish plants in Seattle cannot be met at this time without increasing supply of power, and the superintendent states that these demands will continue and the whole question rests upon how quickly the city can secure a new water-power plant. It is not a question of future demands, as contracts are being turned away every day.

ELECTRICAL CONTRACTORS AND DEALERS OF MINNESOTA HAVE STATE SECRETARY.

The Minneapolis District Association Has Good Membership—Jobbers Co-operating.

At a recent meeting of the Minneapolis District Association of Electrical Contractors and Dealers, which was attended by 22 members, including three electrical jobbers, special interest centered in the reports on the national convention at Cleveland by W. H. Vilett and others who attended that convention.

Practically all the members of the old association of electrical contractors in Minneapolis have joined the new association, organized under the Goodwin Plan. The state association, for which C. A. Craft, Minneapolis, is state secretary, has made an increase of 20 per cent in its membership. W. I. Gray, Minneapolis, is state chairman.

Most of the electrical jobbers are co-operating with the contractors and dealers in their association work.

ORDNANCE DEPARTMENT ANNOUNCES NEW DISTRICT FOR ST. LOUIS.

Announcement is made by the Ordnance Department of the establishment of a new district to be known as the St. Louis Ordnance District with headquarters in that city. M. E. Singleton has been named as Ordnance Chief.

The territory covered by the new district will include the States of Missouri, Arkansas, Oklahoma, Texas, Kansas, Nebraska, Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Idaho, Washington, Oregon, Nevada and California.

The district also includes all that portion of the State of Illinois lying south of the northerly boundaries of the following counties: Adams, Schuyler, Cass, Macoupin, Christian, Shelby, Cumberland and Crawford.

The territory embraced by the new St. Louis District has previously been administered by the Chicago District Office.

Electricity in Coal-Mining Operations

Electrically Operated Undercutters—Electric Power at Mine Tipples—Data on Electric Safety Lamps for Coal Mines

By FRANK HUSKINSON
Chief Electrician, Rocky Mountain Fuel Company

This is the fourth of a series of articles dealing with electric power applied to the numerous phases of coal-mining operations, including surface and underground haulage, drilling, undercutting, pumping, signaling and coal handling. The series also gives interesting facts relative to changing from the isolated power plant to central-station service. The questions of mine lighting and telephone systems and electric blasting are also given attention.

THE electric chain breast coal undercutter is one of the early-developed types of coal-cutting machines. It is a portable machine of high power and great effectiveness, with a truck for transferring from place to place, and a reel of duplex cable for conducting the necessary power current. When the machine is taken to the working face of the coal and unloaded, it is placed in position and a cut made under the bottom of the coal. This cut is from five to seven feet in depth and about three feet wide. The machine is then backed out of this cut and moved over far enough to make another cut in same manner. This process is kept up until the face of the coal is undercut all the way across the room or entry.

The electric motor for driving the cutter chain and other parts of the machine is a compound-wound, direct current, and runs at a pressure of 250 or 500 volts. These are the standard voltages that are in use underground at coal mines. The electric chain breast machine is an old-timer, and it does the work very satisfactorily, but it is being replaced with the more up-to-date shortwall electric mining machines, illustrations of which are given herewith.

The shortwall electric mining machine is a modern coal cutter. Its very special advantages are those which effect economy and safety of operation, rapidity of cutting, continuous working, low-maintenance costs, ease of handling and operation, reliability of working, and readiness of adjustment. All operations are made by the power of the machine. The depth of the cut is from five to ten feet, depending entirely upon the length of the cutter bar. The machine is sumped in the coal at the face of the room, and then by means of steel cables and friction drums the machine pulls itself across the room undercutting the coal to the depth of the cutter bar.

One design of electric coal cutter of this type consists of a flame-proof, or explosion-proof machine, for

Electrically Operated Shortwall Coal Cutter—The Sumping Cut.

Slabbing and Loading Machines in Coal Mines.

use in mines where gas is present. All the electrical parts are so enclosed as to prevent ignition of outside gases by any sparking inside the motors. The electric motors on this type and on all shortwall types of mining machines, are compound-wound, and of ample horsepower to take care of a severe overload. The controllers on most of the shortwall mining machines are of the drum type, with a magnetic blowout coil. The reel of cable is automatically reeled up or paid out by a friction arrangement on the reel truck. The trucks are such that the men can ride on them when going from one place to another in the mine.

By the use of electric coal cutters in the mines, it is estimated that the cost of production of coal is reduced from ten to twelve cents per ton. The superiority of the electric shortwall mining machine is generally recognized. Illustrations used herein show the shortwall electric mining machine in the various stages of undercutting the coal in a room.

A new type of electric coal cutter, that has not been on the market very long, but which has a good name, is called the Arcwall. Instead of undercutting the coal, the arcwall cuts out a strip in the middle or at the top of the coal seam.

Electric Power at Coal Mine Tipple.

Electric power at the coal mine tipple is applied to pulling up the pit cars and dumping the coal into the chute, and to either the pusher type or conveyor type of box-car loader. Both types of box-car loaders are successfully used at the coal mines. The motors used for tipple and car-loader operations are compound-wound, direct-current machines, or, in some cases consist of the induction, variable-speed motors, with wound rotor. The greatest difficulty experienced in operating motors in these operations is due to the continual presence of fine coal dust, in the surrounding atmosphere, which lodges and packs in the windings and bearings. This unfavorable condition is partly overcome by having the motors entirely enclosed.

Between the coal chute, into which the coal is dumped, and the car loader is a slowly-moving picking table on which the coal is passed along, by which an opportunity is given to remove rocks, slate, drill steel, hammers or other substances.

Electric Safety Lamps in Coal Mines.

The danger of coal-mine explosions, resulting from the use of the unprotected flame of lamps, has brought into use the miner's electric cap lamp. The best ingenuity has been exerted in developing portable electric lamps and making them practical. Among the first of the types to be brought up to the workable stage was that using the lead-acid storage battery. There are several makes of this type of cap lamps which are approved for coal mine use. Another kind,

Coal Cutter, with D. C. Motor, 10-Foot Cutter Bar, Danta, Va.

Shortwall Type Coal Cutter, Operated by 35-Horsepower Motor.

in use to a considerable extent, contains the Edison alkaline type of battery.

The portable electric safety lamp is also attached to the heads of mules in mines where those animals are used for coal-car haulage.

The use of the portable electric lamp, in safety-first methods, at the coal mines, is well illustrated by having the front and the rear ends of trip trains equipped

Electrically Operated Slabbing Machine in Coal Mine.

with portable electric lamps, with a red lens on the front and green lenses on the sides, as well as some means of making a warning noise as the trip approaches.

The electric cap lamp and the portable storage battery have done much in the movement for safety, and better general working conditions, in the coal industry.

FEDERAL ENGINEERING EMPLOYMENT BUREAU FULFILLING NEED.

Interesting things are happening in the world of technical affairs. The work of the Division of Engineering, United States Employment Service, is becoming so extensive that it is becoming evident that it will soon bring about the disappearance of the paid employment agencies. The Division of Engineering, however, is not concerned about this, for it is the opinion of the Director, A. H. Krom, that it is about time that a man has the privilege of working for the Government without paying some commercial concern for the right to do so. Despite the short period of its establishment, the Division of Engineering has made many interesting and even surprising discoveries in regard to the engineering profession. It has found many actual cases where men have been compelled to pay fees to commercial agencies before they could get positions in the shipyards and other war activities. It has found also that the engineer and technical man has actually been used by unscrupulous people who have taken advantage of the general confusion in order to enrich themselves.

It is the opinion, however, of the director that by proper educational methods, the individual engineer will learn that he need no longer pay for employment services, because he can get them free of charge from the Government itself. Of course, the service that the Division of Engineering can give is necessarily better than that of all others. It has the supreme advantage of being direct. It is based on a comprehensive view that takes in military, commercial and national considerations, and that considers the man and his ability as well as priority and essential needs.

Thus far, the Division has received remarkable support from military and governmental authorities, all of whom have recognized in it a medium for efficient patriotic service. The technical societies have also been enthusiastic in their support, though some few, somewhat custom-bound, have been slow about co-operating. Their attitude, however, will undoubtedly change as they become convinced of the real worth of the Division. They must certainly see that eventually a central governmental department of this sort will establish order in the engineering world, and will give the individual man rights and powers of which he has long been deprived.

ELECTRICAL BUSINESS IN FAR EAST.

Edgar A. Wilhelmi, export manager of the Robbins & Myers Company, Springfield, O., has recently returned from a four-months' trip to the Far East, including the Hawaiian Islands, Japan, China and the Phillipines.

Mr. Wilhelmi states that in general the industries of these countries are experiencing the same prosperity as those in this country, due to the war demands. The only adverse conditions affecting business are the uncertainty of receiving goods and the high freight rates.

In Japan business is especially active and all branches are sharing in the general prosperity. As in this country, the only limiting factor is the difficulty of obtaining raw materials. Japan is rapidly becoming an important manufacturing nation, and the electrical manufacturing industry is becoming especially strong. There are more than 50 manufacturers making small electric motors, generators, transformers, fans, lamps, and supplies. They have made notable advances in these lines, patterning their goods after American and European designs, but so far the same progress has not been made in the manufacture of heavy electrical machinery.

In addition to the eastern markets Janapese manufacturers are reaching out for the world trade and at the present time they are sending salesmen to South America, Australia, India and even into the United States and Europe. They seem to be capable of making goods of fair quality at extraordinary low costs due to the low labor costs, and bid fair to become one of the active competitors of the United States and European countries in the drive for world trade after the war. Japanese manufacturers are encouraged by the government by protection in the home markets which makes it practically impossible for foreign manufacturers in many lines to enter this market successfully.

CHANGES IN STAFF OF WASHINGTON WATER POWER COMPANY.

Among the changes which have occurred in the staff of Washington Water Power Company, Spokane, within the last few months, the following may be noted: H. L. Bleecker, vice-president, has taken on the duties of general manager; J. B. Fisken, formerly superintendent of light and power department, has become chief engineer; V. H. Griesser, formerly electrical engineer, now occupies the position of consulting engineer; B. M. Merrill becomes superintendent of light and power; B. W. Henderson is superintendent of transmission and distribution; M. W. Birkett, formerly assistant superintendent, has been made assistant to the general manager; V. G. Shinkle, formerly purchasing agent, is now secretary-treasurer.

Features of an Electrically Operated Marine Railway

Installation on Illinois River Served by Central-Station Company—Boats Carried Through Channel

THE accompanying illustrations show the equipment by means of which electricity operated the Spring Lake Marine Railway, designed to serve the same purpose as a marine lock. This electrically driven railway is located on the Illinois River Valley about 30 miles below Peoria, Ill., and was built by the Spring Lake Drainage and Levee District.

It was constructed for the purpose of reclaiming about 14,000 acres of land that was subject to overflow by the Illinois River. At first it was thought that a lock should be constructed for the purpose of communication between the river and the lake, but the cost of the construction and maintenance would have been so burdensome upon the Drainage District that the matter was referred to the Rivers and Lakes Commission of Illinois, and approval was obtained for the construction of the marine railway as being adequate to serve the needs of the public for navigation.

Chief Engineer Jacob A. Harman, who supervised this construction, points out that a satisfactory test was conducted by the engineers of the Drainage District in the presence of the Rivers and Lakes Commission, the electric power for operating the mechanism being supplied from the power plant of the Canton Gas & Electric Company. The transmission line, about 20 miles long, is a 13,000-volt line and also supplies electric current for the Banner and the Spring Lake Drainage Districts pumping plants.

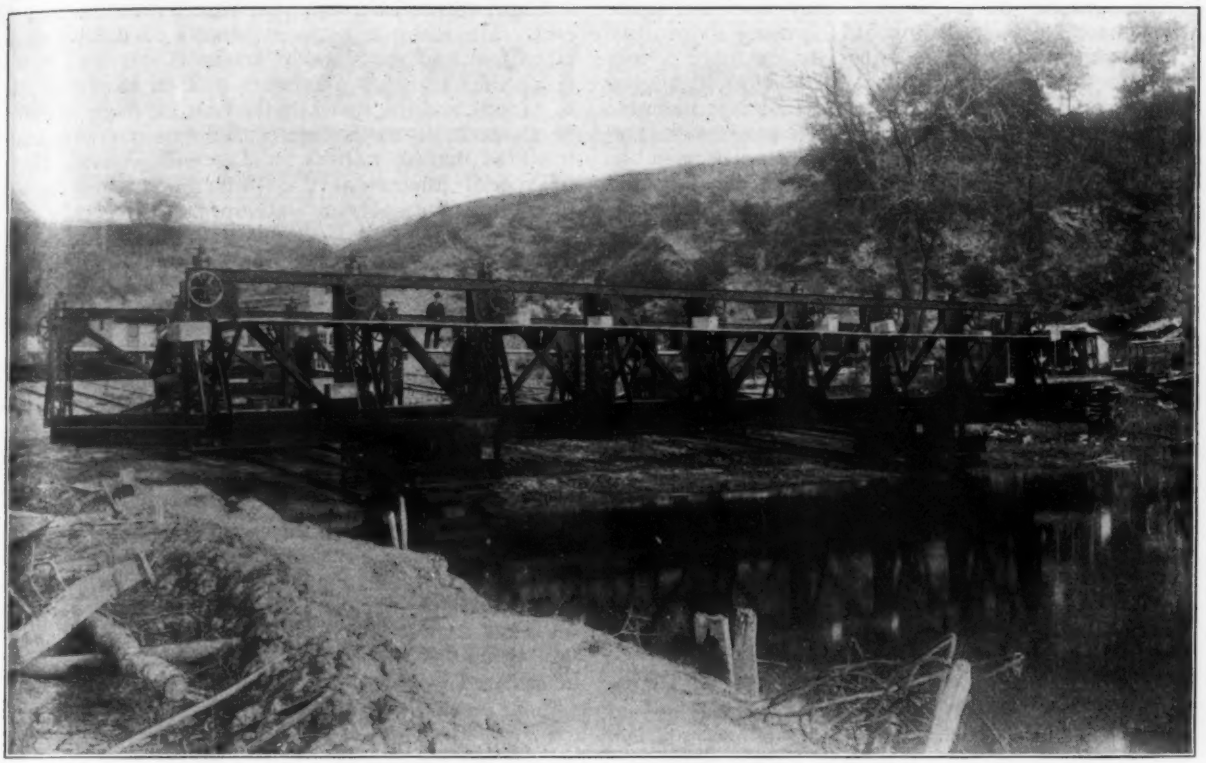
It will be noted that this electrically operated marine railway consists of an incline track leading up each slope of the levee to a turn-table located on the summit of the levee. A cradle, or boat carriage, is mounted on wheels so that it can be lowered on these inclines into the water to receive the boats, raised to the turn-table, rotated thereon, and lowered to the water again on the opposite side of the levee, keeping the boat in its natural position throughout all of this operation.

There have been provided an electric hoisting motor for hoisting and lowering the boat carriage, and an electric swinging motor for rotating the turn-table, housed in a reinforced-concrete building alongside the turn-table. The mechanism was designed on the basis of handling as a maximum load a flat-bottom barge, or power boat, 24 feet wide, 120 feet long and having a draft of 3 feet 6 inches.

The cradle, however, is sufficiently wide to accommodate shorter boats of a maximum width of 28 feet. Smaller boats, barges and launches can also be handled. Each incline consists of two standard gauge railroad tracks, laid parallel and spaced 50 feet center to center, the gradient of the tracts being 10 per cent. These tracks extend from the turn-table down into the water on each side of the levee to a depth sufficient to have four feet of water over the floor beams of the boat carriage at the low-water stage.

The rails used for all tracks are 120-pound standard T-rail sections and are laid on creosoted ties 6 inches by 8 inches by 10 feet 0 inches, spaced 16 inches on centers, and these ties are compacted in place in a bed of sand. They are at least 12 inches deep below the bottom of the ties in all places. The turn-table at the summit of the levee is in effect an extension of one of the inclines and is mounted on a steel structure pro-

Electrically Operated Boat Carriage in Canal.



Boat Carriage Being Hoisted Up Incline.

vided with wheels on which the structure may be rotated about a fixed pivot on circular tracks.

It will be observed that these movable floor beams are hung on heavy threaded rods which extend upward through the upper chord of the truss, at which point the rod is suspended from the top of the truss by means of a split nut with four handles resting on a short coil spring. There is also provided a winch adjustment for each of these rods for raising the beams rapidly to position, after which the split nut is closed and the beam is brought up close by the use of the nut.

So as to facilitate the raising of these beams, they are constructed in the form of a box girder closed at the ends and are made water-tight so that they have considerable buoyancy when under water. Counterweights are also provided on the winches, so that the weight of these movable floor beams is so nearly counterbalanced as to require a very slight lifting effort to bring the beams to their proper position. This boat carriage is supported on two specially constructed eight-wheel trucks of a heavy type, the mounting being arranged so that the floor of the boat carriage is always in a horizontal position.

Attention is called by Engineer Harman to the fact that each of these trucks is provided with special draw bars to which are attached the steel haulage cables used for raising and lowering the boat carriage on the inclines. Each truck is also provided with a system of brakes which may be set by hand and which are so constructed as to be set automatically by a coil spring whenever the tension of the haulage cables is released.

There are two electrically driven hoisting drums, one for raising and lowering the boat carriage on the inclines and the other for rotating the turn-table. The main hoist drum is 60 inches in diameter, carrying two 1.5-inch steel cables each having a maximum working load capacity of 50,000 pounds. From the drum these cables pass to the center of the turn-table and then separate, running over a system of 60-inch sheaves, leaving the turn-table on the center lines of the two incline tracks, and connecting to the two draw bars of the boat carriage. Means at this point is provided for adjusting and equalizing the tension of the two cables.

It is of interest to note that this main hoist drum is driven through a train of spur gears by a 75-h.p., 60-cycle, slip-ring type induction motor with a drum-type controller mounted on the operating platform. The gear ratios are such that the main haulage drum makes approximately one revolution per minute, and the traveling speed of the main haulage cables is approximately 16 feet per minute. All of the shaft bearings are mounted on heavy cast-iron sole plates of the box type, grouted in and securely fastened to a massive concrete foundation by heavy foundation bolts.

The drum is of heavy cast-iron construction, with the main driving gear at one end and the main brake spider at the other. The brake drum is 10 feet in diameter with a 14.5-inch face. This brake is applied by means of a system of heavy weights and levers, and is released by raising the weights with a drum and wheel hoist mounted on the operating platform.

There is a pawl and ratchet device on this hoist which keeps the brake mechanism in the released position after the weights have been lifted by the hoist. This pawl and ratchet device may be released, thus applying the brake on the main drum, by means of a foot trip mounted on the operating platform; also by means of a ratchet device, which engages the teeth of the large gear when the cable starts to unwind, thus automatically setting the brake. There is also a centrifugal governor, which automatically sets the brakes should the speed of the boat carriage exceed the predetermined speed of 16 feet per minute; and an electric solenoid device, which automatically sets the brake in case the supply of electric current should be interrupted.

The ratchet device automatically sets the brake when the cable starts to unwind; is made inoperative when lowering the boat carriage by means of a foot pedal on the operating platform. The centrifugal governor is also provided with a speed indicator mounted in front of the hoist operator, showing when dangerous speeds are approached. In order to prevent the brake being applied too suddenly when the weight is released, an oil dash-pot is provided to regulate the speed of application.

The turn-table swinging gearing, 36-inch drum, is driven by an 18-h.p., 3-phase, slip-ring type induction motor with a reversible drum type controller mounted on the operating platform. The brake on this gearing is operated by a hand lever mounted on the operating platform, and the traveling speed of the cable, which is hitched to the outer trucks of the turn-table, is 20 feet per minute.

Besides the safety devices provided, there are three special indicators to aid in the operation of the apparatus. A speed indicator is used in connection with the centrifugal governor and a circular indicator, 4 feet in diameter, mounted in front of the operating platform for indicating at all times the position of the turn-table relative to the inclined tracks.

There is also provided a horizontal indicator, 12 feet long, mounted just above the main drum in front of the operating platform, which indicates continuously the position of the boat carriage on the inclines. Above the floor level the operating platform is located with windows which make it possible to note the general position of the boat carriage and turn-table most of the time. The view is at times somewhat obscured and the indicating devices are of great assistance in operating the mechanism.

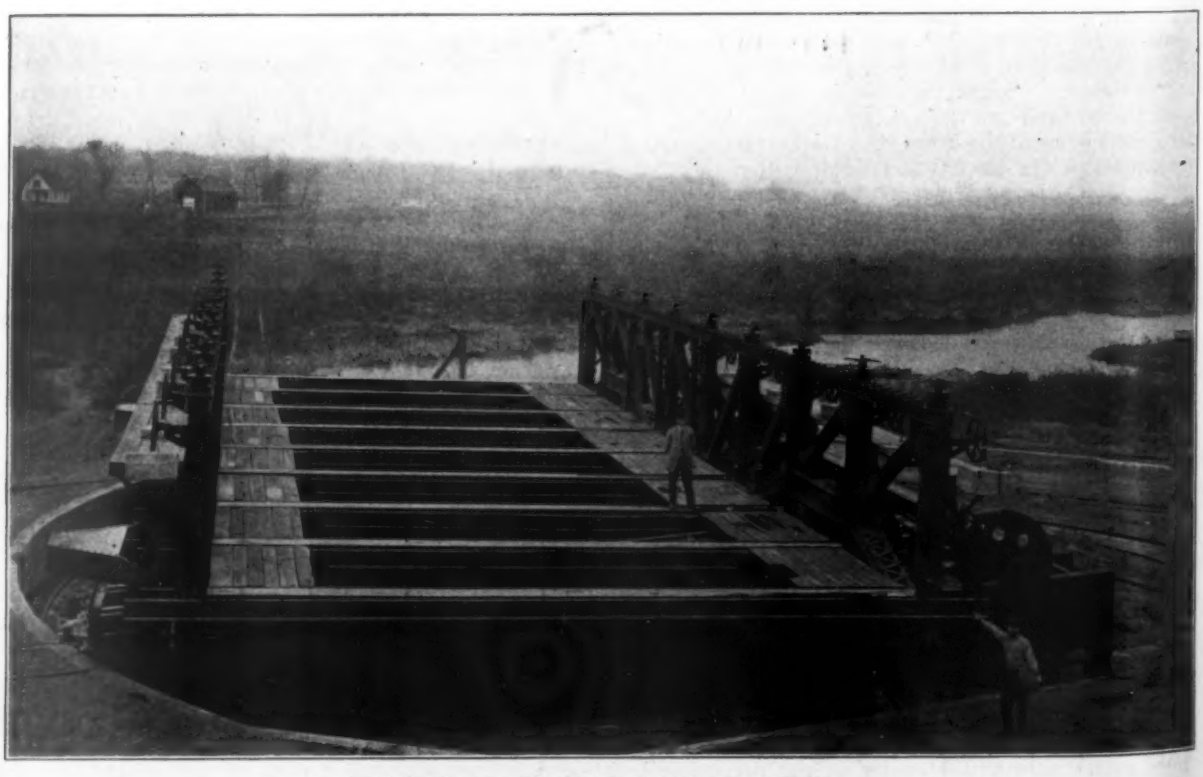
This electric driven marine railway has a maximum lift of 27 feet and has maximum weight for the boat carriage and boat of about 400 tons.

The largest boat that it is calculated to carry has a length of 120 feet, width 24 feet, with a draught 3.5 feet. The distance between centers of incline tracks is 50 feet and the slope of tracks is one foot in ten, while the estimated maximum pull on haulage cables is 50 tons and the speed of the boat carriage is said to be about 16 feet per minute. This unique electrically operated marine railway in Tazewell County, Ill., is of special interest at this time when all means of transportation are being developed to the greatest efficiency possible.

STONE & WEBSTER COMPANIES CONSOLIDATE.

All the properties of the Stone & Webster Engineering Corporation in Beaumont and Port Arthur and the interurban electric line which connects the two places, have been consolidated under the name of the Eastern Texas Electric Company, which has just been incorporated with a capital stock of $2,850,000. This merger was accomplished by the filing in the Secretary of State's office of amendments to the charters of the Jefferson County Traction Company, which operated the interurban line; the Beaumont Traction Company, the Beaumont Electric Light & Power Company and the Port Arthur Light & Power Company. The cities of Beaumont and Port Arthur by referendum vote authorized by merger.

The Electrical Research Committee which comprises representatives of the Institution of Electrical Engineers and the British Electrical and Allied Manufacturers' Association, and which operates under the auspices of the Government Department of Scientific and Industrial Research, is at present engaged in superintending a research on insulating materials (fibrous materials, porcelain, ebonite, mica, composite materials), and the waterproofing treatment of insulating windings of electrical machines.



Boat Carriage on Electrically Operated Turn Table.

Editorial Comment

Coal Mine Electrification

FOR MANY months the coal mines of the country have labored under many difficulties. The demand for coal has increased and exceeded expectations and preparations, lack of cars and erratic car supply, the shortage and vicissitudes of labor have combined to make coal production difficult and output variable. It is rather natural therefore that the mine operator, seeking relief from those influences within his own power to remedy should turn to coal mine electrification as the solution for part of the problem, so far as there is any one solution.

Electrification of coal mines enables increased production at lower unit cost, and reduces the effect of variation in quantity and quality of labor. Not only does it speed up production while lowering the cost, but it permits of sustained effort such as would be impractical if carried on only by human and animal effort. Electrification, therefore, appears particularly desirable not only for maintained outputs, but for those mines where the ability to ship and produce may suddenly increase radically, due to thawing of waterways, availability of cars and similar reasons. Steadiness of work is a factor in maintaining labor at its task. Better working conditions is another factor, and electrification assists both of these, making individual effort lighter yet more effective. And then electrification usually means more scientific mining, less sacrifice of coal grades to haste and output, and permits of bringing out coal that otherwise might be left behind in abandoned workings, a common condition but one antagonistic to coal conservation.

The mine operator today is facing the problem of electrification not as a panacea, but as a necessity. Electrification is at best expensive, although often a justifiable expense that soon becomes a profit. As electrification and the results accompanying it are needed without delay and at minimum initial cost, the mine operator turns instinctively to central-station service, and purchased energy is adopted almost invariably wherever feasible.

Coal mining is a specialty in itself, as is likewise the generation and distribution of electrical energy. The coal operators are realizing that all fuel has a market value, and even if cheap, is more profitable when sold at market prices than when consumed by themselves efficiently or inefficiently for the generation of their own power. Readiness when required, minimum investment, freedom from responsibility for maintaining and operating a power plant, absence of feed-water troubles, elimination of reserve capacity, obviation of costly shut-downs for repairs, are some of the other benefits that go with purchased energy for coal mine operation. The lower cost of production and the greater output alone warrant giving the matter of electrification serious thought; the other benefits above enumerated should clinch the matter.

With present coal prices, high but fixed, it is, of course, incumbent upon the coal mine operator to be leery about spending money for obtaining equipment without good promise of being able to make it a paying proposition. However, with coal mine electrification, even with inability to raise the price of his produce, the average coal producer will find the increased rate of production, the higher load-factor of his mine, and the reduction in labor troubles and over-all higher economy of doing business incident to electrification can well afford to be capitalized. It will be a long time before coal will be cheap again. All the labor situation will not mend in a day.

Electrically-operated hoists, coal cutters and locomotives have a way of bringing in large return, and with little care may be operated so as to enable maintaining a very steady load at the mine, permitting the peak to be kept down and the load-factor and power-factor kept up—matters of importance whether the mine supplies its own power from capacity loaded to the full or not, or whether it purchases it.

Choice of systems of electrification, continuous or alternating current, trolley or storage battery locomotives, are such that each mine must make the choice according to the characteristics of its own mine, the characteristics of the coal, the susceptibility of explosions of the workings, mine lay-out and area covered, thickness of seams, and so forth. But whether alternating current is chosen for the cutters, drills and compressors, and trolley or battery for haulage, the fact remains that central-station supply is the way in which electrification can be carried out in shortest time with least money tied up in electrification and for highest over-all economy. And, moreover, it is always the most efficient way as well as the cheapest and least troublesome, both at the time and in the long run.

A coal mine never remains the same for long. As coal is taken out the workings extend downward and lengthwise. The power plant or substation at the mine head or shaft thus tends to become farther and farther removed from the center of gravity of the load, which is, of course, the ideal location for the source of power, for minimum investment in copper, closest voltage regulation, flexibility of control and emergency service. A flexible arrangement of conductors, the use of portable substations and recording instruments should be encouraged for the overloaded circuit, poor voltage regulation and service interruptions exert an enormous influence in retarding mine output and the two former

are a prolific source of burnt-out apparatus. One of the great advantages of purchased power is that it can often be delivered where wanted, and as the mine changes so can the location of power delivery change. And as the load grows it is a comparatively simple matter to purchase more power—a matter of transformers, motor-generators and conductors—as compared to installing larger generating capacity for the mine-owned plant.

The advantages of purchased power are too well known to need repeating here. But they are so important in the interests of the country, for the success of the mines, in increasing coal production, and on behalf of the central stations that they should be placed squarely before every mine operator who might become a central-station customer. Coal is a national asset, not a personal possession to be sold and abused and wasted according to individual whim. The time is coming, perhaps more rapidly than many suppose, when mine operators will no longer be allowed to abandon half-mined workings because it does not now pay to mine them, or lower the quality of coal by careless and hasty mining.

Electrification of coal mines is not a panacea by any means. But it offers a palliative for many of the existing ailments of the country's coal mines. And the coal mines and the country's coal situation have at present too many ailments for the Nation's well-being.

Central-Station Supply and Prosecution of the War

EVEN in these days of easy familiarity with sums counted in hundreds of thousands, or even in billions, the statement that the central-station industry of this country represents an invested capital exceeding three billion dollars establishes the importance of the business. Yet it is not the investments, the income from service, nor yet the number of employes that indicate the real war-time importance of this activity. It is the extent to which other industries and war activities are dependent upon it for their light and power that shows what a factor in the winning of the war electricity is.

It has been estimated by the secretary of the National Electric Light Association, says the *Edison Monthly*, New York, that no less than 60 per cent of the power used in the manufacture of munitions is electrical—furnished by central stations. Camps and cantonments are all lighted electrically, and invariably the current comes from a nearby central power plant.

Perhaps the biggest instance of central-station supply for the production of war equipment is the Hog Island shipyard on the Delaware. The great plant with its 50 launching ways stretching for miles along the river front, and its innumerable shops and buildings housing the activities incident to shipbuilding, its working force of 30,000, its sewage system, its water-supply system, its warehouses and theaters and its several air-compressor plants, is different from most communities of the same size, for it has no electric light plant. Instead, it secures its supply of electrical energy for a connected load of 35,000 kilowatts from the system of the Philadelphia Electric Company. Every large central-station company in the country is also supplying munitions or ship-building plants.

While in every case the companies have been able to furnish and maintain the required service it often happened that unusual problems and unexpected difficulties had to be surmounted. The engineering problems were disposed of in the usual way by the engineers of the companies; but even with these problems out of the way it was not always an easy matter to proceed with the work, for material couldn't always be had for the asking.

The whole story of the part electricity is playing in winning the war may never be told. Some of it will not be told until the war is over. It will be found to have played a leading part.

Added Outlets Mean Added Load and Added Business for All

SINCE the early days of the electrical household appliance central stations and dealers have lamented the lack of convenient outlets in the home. Even in the comparatively modern and better class houses the wiring has been done with little or no regard for the use of the many labor-saving devices that now are indispensable to the housewife. Considerable educational work has been done among architects and others, but not until the use of appliances became a war-time necessity did the subject receive the attention that it justly deserves.

Undoubtedly the homes of the future will be wired in accordance with the best practice insofar as outlets are concerned. However, there are many thousands of houses, already wired, where conditions can be materially improved by the installation of convenient outlets. Many central stations and contractors have already realized the possibilities in this direction and have individually gone after the business with excellent results. Concentrated action will be possible next month when the campaign of the Society for Electrical Development is launched.

Beyond the immediate business possibilities, which are tremendous, the campaign is one of conservation, of enlightenment, of encouragement, whereby the user of electricity will be informed as to the possibilities for saving fuel, food, time and money by wire.

Every branch of the electrical industry can benefit by active participation in the forthcoming campaign and the society's appeal for co-operation should not go unheeded.

Week's Events

Iron and Steel Engineers to Meet — Exhibit of Foreign Goods — Co-operative Methods to Speed Coal Production

NEW YORK CONTRACTORS HOLD OUTING.

Over 90 Members Participate in Annual Picnic of Associated Electrical Contractors' Association.

The Associated Electrical Contractors' Association of New York City, otherwise the Metropolitan Section of the New York State Association of Electrical Contractors and Dealers, held their annual outing on Thursday evening, August 15, at City Island. The attendance far exceeded expectations as, following the drive by auto from the city, over 90 members and their guests gathered at the water-side terrace of Tauer Inn for the excellent supper served.

President H. M. Walters, after his opening address, designated Louis Levine to act as toastmaster and the merry quips of good fellowship fell thick and fast. The issues of the day were ably discussed by J. P. Ryan, secretary of the New York State Contractors' Association, and W. L. Goodwin, author of the "Goodwin plan" of contractor team-work and representative of the National Electrical Contractors' Association.

Chief Inspector George Bruin of the New York Suburban Board of Fire Underwriters, addressed the members and influenced a perfect understanding between them and the Inspection Department. Remarks from other good speakers were heard and Louis Kalisher of the Long Island Section made a forceful address on organization welfare matters, following which the White Fleet of "Sight-seers" returned to the city after the most successful summer outing in the records of this truly "live-wire" organization of good fellows.

PROGRAM FOR A. E. & S. E. E. CONVENTION.

Iron and Steel Electrical Engineers to Meet at Baltimore, Md., September 11 to 14—Important Topics to Be Discussed.

The twelfth annual convention of the Association of Iron and Steel Electrical Engineers is announced for September 11-14, at the Southern Hotel, Baltimore, Md. The opening session, which will be held on Wednesday morning, September 11, will be a business meeting for association members only, at which reports of officers and committees will be made and officers for the ensuing year elected. Four technical sessions are scheduled for the convention, at which the following important papers will be presented:

"Rules for Safe Operation of Electric Cranes," by Safety Committee.

"Methods of Education for Electrical Employes of Iron and Steel Mills," by Educational Committee.

"Automatic Engine Stops," by Walter Greenwood.

"Bridge-Motors for Overhead Traveling Cranes," by R. H. McLain.

"Condensers and Condenser Engineering Practice," by D. D. Pendleton.

"Standardization of Ratings for Large Rolling Mill Motors," by K. A. Pauly.

"Electrically Driven Mills," by J. T. Sturtevant.

"Remote Controlled Substation," by W. T. Snyder.

On Friday afternoon, September 13, members of the association will make an inspection tour of furnaces, steel works and shipyards of the Bethlehem Steel Company, at Sparrows Point, Baltimore, Md.

The Electric Welding Committee of the Emergency Fleet Corporation will hold a joint session with the Philadelphia Sections of the American Institute of Electrical Engineers and the Association of Iron and Steel Electrical Engineers, and the Engineers Club of Philadelphia, at the Bellevue-Stratford Hotel, Philadelphia, September 16, at 8 p. m. The very important and timely subject of "Electric Welding a New Industry" will be discussed at this meeting and all members of the association are requested to attend.

GOVERNMENT EXHIBIT OF FOREIGN ELECTRICAL GOODS.

Opportunity Afforded American Manufacturers to Study Foreign-made Products.

There is on display at the New York office of the Bureau of Foreign and Domestic Commerce, a large technical collection of samples of electrical goods used in foreign countries. The exhibit is made up of a comprehensive selection of the goods most employed in electrical work in various foreign countries and includes wiring devices, heating appliances, electrical porcelains, dry cells, flash lights, electric bells, conduit and conduit fittings, insulated wire, etc.

These samples have been forwarded mainly in connection with the special investigations undertaken in South America by P. S. Smith, and in Australia, New Zealand, China, Japan and Eastern Siberia by R. A. Lundquist, special agents of the Bureau. Complete data accompany each article on exhibit, giving country of origin, where obtained, how used, selling price, etc.

There are several hundred items in the exhibit, and these have been specially arranged by T. O. Klath, commercial agent in charge of the Bureau's exhibit room, for inspection by electrical manufacturers and exporters in order that they may make a personal study of the classes of goods with which their products come into competition abroad.

These samples of foreign goods available through the efforts of the Bureau of Foreign and Domestic Commerce, are being made broad use of by the manufacturers of the United States. An interesting case was recently learned of, where an electrical manufacturer immediately visited the sample room upon learning of the arrival of a shipment of goods from a foreign market, and carefully studied certain items in which he was interested. Returning to his plant, he developed a similar line of superior design, cabled quotations and data to his agents in the market, and

began selling a new line which has rapidly grown to large volume.

There is a wide field abroad for standard American electrical goods, as well as for adaptions of American designs to foreign requirements, and when our electrical manufacturers study the types of goods now in use in such markets, they can obtain a grasp of the standards and of the conditions existing that can be secured in no other way except by a personal visit to the field, and this knowledge will enable them to push the sale of their goods with the best possible efficiency.

R. A. Lundquist, himself a consulting engineer, who conducted the investigations in Australia, New Zealand, and the Far East, will be in New York during the exhibition, and will discuss with visitors the uses of the various items in the exhibit and the electrical practices in the different countries from which the samples have been secured.

COAL PRODUCTION FAR SHORT OF REQUIREMENTS.

Statement of Fuel Administration Shows Co-operation Measures Being Adopted to Speed Production.

While in the production of both anthracite and bituminous coal the country is considerably below the program set by the United States Fuel Administration as marking a minimum at which the necessary war work could be carried on at the rate of highest efficiency, the fact remains that coal production has reached a higher point than ever before in the history of the industry.

In a great many districts, both anthracite and bituminous, production records have been broken, but still production remains short of requirements, by several million tons.

Almost daily applications are coming to the United States Fuel Administration from war industries for allotments of coal in addition to those made at the beginning of the coal year. Some are from new plants authorized by the War Industries Board, not known to the Fuel Administration at the beginning of the year. The requirements for these plants are in addition to the original allotments. Other demands are from plants already on the preferred list of war industries, for increased allowances because of enlargements and extensions to original plants, made since the Fuel Administration compiled its estimates of consumption.

The increased demand for coal for the Navy reached almost 100 per cent in July. Whereas three and a half million tons was allotted to the Navy in April, the requirements by the middle of July had reached a basis of six million tons. By the end of the calendar year 1918, it is estimated that approximately eight million tons will be needed to cover this demand.

With the launching of new ships, the requirements of the Shipping Board have likewise grown beyond all expectation. When the annual allotment was made, at the first of April, ten million tons was assigned for the purpose of the Shipping Board. The actual requirements as demonstrated by experience, and as a result of the phenomenal results being achieved by the Shipping Board, now place the figure at thirteen million tons.

So also coal for bunkering purposes, at first estimated at thirteen and a half million tons, has grown in demand until present calculations call for twenty-one million tons.

New industries, not in operation at the beginning of the coal year, are now running full tilt or are about to start. From these come demands for coal of consequential proportions. These new requirements alone represent an annual consumption of nearly a million and a half tons.

Aside from the increased requirements originating from new or enlarged plants, many old plants, rated at the beginning of the coal year for marked increases of allowance over the consumption of 1917, are now demanding still more coal. Practically all the steel plants and furnaces are running on full time, twenty-four hours per day. There are no suspensions of operations save for repairs and overhauling of plants. In some instances the yearly coal requirements were underestimated. In many others, enlarged production, under increased efficiency, has created a demand for additional coal. Invariably, increased steel production calls for increased coal production, demanding about five tons of coal for each ton of steel produced.

In response to appeals by Director of Production James B. Neale of the United States Fuel Administration the mine workers are making every patriotic sacrifice possible to get out the coal. The ranks of the mine workers have been depleted by the draft and by voluntary enlistment and, because earlier in the year there was such a marked shortage of cars so that the mine workers could not work steadily, numbers of them drifted into other war work and are lost to the mines.

On the other hand, the mine workers who remain are doing their part nobly. In a great many instances they have given up their carnivals and picnics so that work may not be interfered with. They have changed a time-honored custom of attending the funeral of a comrade-worker, killed in the line of duty, which funerals always kept the mine idle for a day, and, instead are represented by a committee. Old men, long retired from active mine work have voluntarily come out of their retirement and ease and gone back to work to aid the Government in this crisis.

The drive has not all been directed at the mine worker; the coal operators also have been strongly reminded that they have very positive duties to perform toward increased production. In a letter just sent to all the coal operators, Director of Production Neale declared:

"You must practice the highest degree of efficiency as to mine management and must see to it that your employes are given fair and courteous treatment. As you well know, there are two important factors in the production of coal. One, the operator; the other the mine worker. The latter is helpless to do his part, no matter how willing, if you do not provide him with the means with which to do it. Plenty of mine cars, good air, sufficient timber and other materials are a few of the things you must provide.

"It is true that each day throughout the country many thousands of tons of coal are not mined, due to absence, inefficiency and short hours worked by the mine employes; but it is equally true that each day many thousands of tons of coal are not mined due to the fact that the operators have not made it possible for the mine workers to do as much as they are willing to and would do. Both effective factors must be determined to do better than ever before. I hope that a wholesome, friendly spirit of rivalry will quickly develop between the mine management and the mine workers so that each group will try its best to see that it has not prevented a marked increase in tonnage and that, on the other hand, it has contributed the major part of a large increase in tonnage."

Commercial

Lamp Window Display—Central-Station Service Effects Great Coal Saving—Electrical Equipment in Theatre

MINNEAPOLIS COMPANY ANNOUNCES NEW COOKING BUREAU.

The Minneapolis General Electric Company, Minneapolis, Minn., which for three years has been supplying domestic cooking information for its customers based upon its growing number of patrons employing electricity for cooking, has now opened a Commercial Cooking and Baking Bureau. The bureau will be in charge of F. W. Cleeland and will specialize in the cooking and baking requirements of apartments, hospitals, hotels, clubs, etc. An advertisement announcing the Bureau is quoted in part:

"The single purpose of this department is to serve, without charge, those who desire assistance and advice in the commercial application of electricity to cooking and baking problems. And just as our Electric Cooking Bureau renders a complete cooking service to the home, so—

"Our Commercial Cooking and Baking Bureau maintains a service, which in its field, reflects the same thoroughness of investigation, the same regard for customers' interests, and the same high standards which have made our Electric Cooking Bureau unique in Minneapolis.

"Electricity is playing a wonderful part in fuel and food saving and we are prepared to demonstrate that electric cooking results in better food, more cleanliness, less work, and the relief of next winter's coal troubles."

ADVANTAGES OF ELECTRIC HEAT.

At the recent sales convention of the Edison Electric Appliance Company, Chicago, the following advantages of electric heat were enumerated:

No special supervision necessary eliminating cost of attendance.

No fuel to be carried in with consequent noise, dirt and incovenience.

No ashes to be removed.

No redecorating necessary, because of smoke, soot or dirt.

Electric heat does not vitiate the air.

Ventilation can be regulated with certainty as no allowance need be made for oxygen consumed or fumes given off.

Heat can be localized, that is, applied when and where necessary with no trouble or inconvenience.

Heat is instantly effective—no need to start "fires" several hours before office opens—10 to 15 minutes is all that is necessary even in extreme weather.

Any reasonable degree of heat can be obtained and maintained if installation is properly calculated.

Heaters are an ornament to any surrounding.

Cost of maintenance of heaters is very low—less than maintenance and depreciation of fuel burning stoves.

Depreciation is almost negligible.

A great advantage also of electric heat is its convenience on early winter and late spring mornings when it is really only necessary for an hour or two morning and evening. On such occasions, it would be very expensive to start fires in fuel burning stoves and dangerous to health of employes to allow them to work without some heat.

AN EFFECTIVE LAMP WINDOW DISPLAY.

The fall of the year is the time when people begin to think of lighting their homes. They are returning from their summer homes, vacations, etc., and a lamp display at this time of the year will suggest to many a passerby that a supply of lamps for home or office is needed.

The accompanying illustrations show an effective lamp window display of the Consumers Power Company, Musekegon, Mich. Fig. 1 was photographed at night and was exposed 10 seconds with four 150-watt Mazda C-2 lamps lighted above the display. Then the C-2 lamps were switched off and the lamps in the display were turned on for two seconds to bring out the cutouts. Fig. 2 is a side view of the display and Fig. 3 shows the exterior of the company's store.

In commenting on the details of the display, H. H. Koelbel, superintendent of sales for the Consumers Power Company, states: "The card in the center of the display which reads 'Buy lamps by the carton, $1.50,' encourages the idea of buying a package which

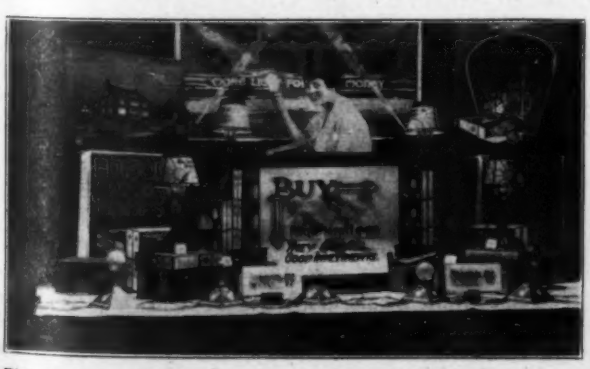


Fig. 1.—Lamp Window Display of Consumers' Power Company.

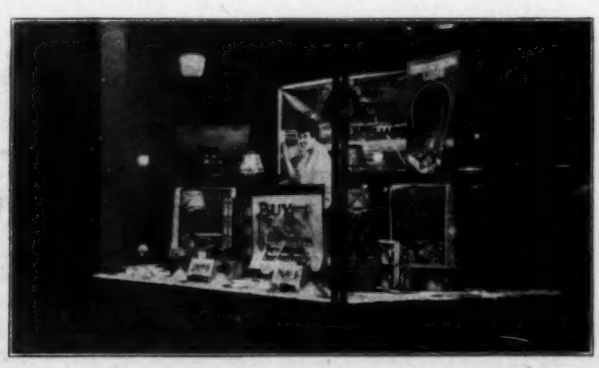


Fig. 2.—Side View of Display—Cartons Are Featured in Sale.

Fig. 3.—Exterior of Store of Consumers' Power Company, Muskegon, Mich.

means more sales and it is a convenient package to carry, which means something today when everyone is carrying their own parcels."

The photographs from which the cuts were made were taken by A. De Windt, chief clerk, Consumers Power Company.

1800 HOUSES WIRED IN MINNEAPOLIS IN SIX MONTHS.

H. E. Young, sales manager of the Minneapolis General Electric Company, reports that the sale of electrical household appliances in Minneapolis during the first six months of 1918 was 21 per cent greater than for the same period last year. The electrical output of the company increased 18 per cent for the period. The company had 53,325 customers connected on June 30. The number of already built houses wired in Minneapolis during the first six months of the year was 1847, an increase of 15 per cent over the number of houses wired during the first half of 1917.

NEW BUSINESS OF MINNEAPOLIS GENERAL ELECTRIC.

The sales department of the Minneapolis General Electric Company, Minneapolis, Minn., secured 435 new electric light and power customers during the week ended August 2, with 230 kw. of lighting and 137 horsepower in motors. This includes 85 horsepower in motors to be supplied the Delano Flour Mill. New business connected to the company's lines shows an increase of 81 customers with 63 kw. of lighting and 8 horsepower in motors. Electric energy output was 6.7 per cent greater than same week last year.

CHICAGO CENTRAL-STATION SERVICE CONSERVES 54,840 MORE TONS OF COAL.

Large Isolated Plants Requiring Over 7,000,000-kw.-h. Go Over to Commonwealth Edison Company.

Coal conservation to an astonishing degree is the result of the discontinuance of 24 privately operated plants in Chicago and the consequent operation of their systems by central-station service. The estimated saving in coal occasioned by this change reaches the enormous total of 54,840 tons a year—enough to keep 5000 large families warm for an entire winter!

By these plants taking over central-station service a total daily requirement of 2,172,000 kw-h. has been added to the Commonwealth Edison Company's operating system—a figure that approximates an addition of nearly 17,000 horsepower. The largest of these plants are:

Name.	Hp.	Kw-h.	Est. Annual Coal Saving.
Chicago Athletic Association	650	95,000	3,300
Cribben & Sexton	200	36,000	1,200
Federal Building	950	145,000	2,200
Interstate I. & S. Co.	3,000	778,000	16,000
Lexington Hotel	163	33,000	1,000
Omaha Packing Co.	400	31,000	1,000
Swift & Co.	7,000	750,000	20,000
Transportation Building	640	50,000	1,500
Vaughn & Bushnell	550	30,000	1,000

In addition to the above the power division of the Commonwealth Edison Company has closed, since January 1, some 48 contracts calling for large installations on the company's lines. The estimated annual coal saving made by these plants using central-station service is approximately 100,545 tons. It also means a service addition of 8,190,000 kw-h., or 47,663 horsepower. The very largest of these contracts are:

Name.	H.p.	Kw-h.	Est. Annual Coal Saving.
Symington Corporation	24,000	4,000,000	24,000
American I. W. & C. Co.	500	65,000	4,000
McCord & Co.	4,250	530,000	7,500
Consumers Steel	2,200	600,000	7,000
Otis Elevator Co.	3,000	550,000	7,200
American Clay Mfg. Co.	2,800	1,000,000	12,000
Winslow Bros.	2,300	570,000	7,200
Hughes Electric Co.	500	50,000	3,000
Western Union Building	1,000	170,000	6,000

WAR ENCOURAGES CHICAGO'S ELECTRIC COOKING LOAD.

Under the direction of the War Community Service a club and canteen is being erected in Grant Park, Chicago, for the use of soldiers and sailors. This club, to be known as the Khaki and Blue Club, will be a wooden frame building, and is to be completed in 40 days from the time of commencing erection. Electricity is to be used throughout for light, power and cooking, one factor contributing toward the choice of electricity for the latter being that gas cannot be readily delivered to the premises.

Chicago has another canteen for soldiers and sailors where they do things electrically. The Library Canteen, located in the Public Library and maintained by the Chicago Woman's Club for sailors and soldiers, also uses electricty for cooking purposes. At this canteen only light meals, coffee, sandwiches and cake are served, during all hours of the day. Altogether about 2500 meals are served daily, free of charge. The cooking load is 4000 watts.

RECORD DOHERTY APPLIANCE SALES.

Total Sales for 1918 Expected to Exceed $2,500,000.

The sales of gas and electric appliances by the new-business departments of the Doherty organization for the first six months of 1918 indicate a large rate of increase, as shown by the following comparative table:

Year.	Sales value.
1914	$ 396,110
1915	694,363
1916	1,224,390
1917	1,870,000
Sales, six months, 1918	$1,073,696
Sales, six months, 1917	769,885

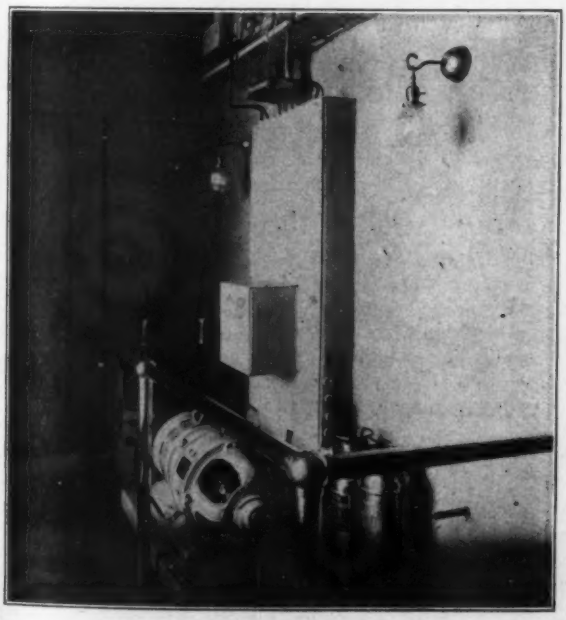
Based on the previous six months sales of this year, it is expected the total for the year will exceed $2,500,000. These sales are far in advance of any similar records on a per capita basis in the country.

MODERN ELECTRICAL EQUIPMENT IN A PICTURE THEATER.

The Progress Theater, of Oakland, Cal., has certainly lived up to its name in laying out and equipping its building. Its auditorium, comfortably seating 800 visitors, is complete in every respect. No means of adding to the comfort and ease of the patrons has been overlooked.

Appreciating the fact that a patron's enjoyment of the pictures is increased by looking after his physical comfort, the management has installed a complete ventilating equipment, providing pure, fresh air at all times. A continuous change of air is had by means of a three horsepower blower and a 12-inch Venture fan.

Three projectors driven by one-sixth-horsepower motors are used for throwing the pictures a distance



Motor-Generator in Progress Theater.

of 117 feet to a screen 18 feet by 24 feet. Power is secured for this from a 55-ampere Westinghouse motor-generator provided with two ballast resistors, and necessary control switches. On the switchboard, in addition to the meters and other equipment, provision is made for supplying direct-current break-down service in emergency. In the operating room there are also one Powers Dissolver, one motor-driven rewinder, 3 Elbert arc controls for maintaining constant current at the arc automatically and 3 Elbert speed regulators. All the equipment is conveniently arranged and well adapted to first class productions. Part of the equipment is shown in the accompanying illustrations.

BRONX COMPANY FILES NOTICE OF RATE INCREASE.

The Bronx Gas & Electric Company, which operates in the old town of Westchester and the extreme northeastern portion of Bronx Borough, has filed with the Public Service Commission for the First District of New York a schedule showing a proposed increase in its electric rates from 10 to 12 cents per kilowatt-hour, with a minimum charge of one dollar per month. The commission has taken no action on the company's request to put this increased charge into effect on six days' notice. The electric rates of this company were under investigation by the commission several months ago, at which time consumers of the company's current appeared to request that the commission make no reduction in the rate, for fear that the loss of revenue would prevent the company from making much needed extensions to its lines.

SELLING ELECTRIC IRONS TO SOLDIERS.

A very large number of electric irons have been sold by the Little Rock (Ark.) Railway & Electric Company to the soldiers located at Camp Pike for pressing their uniforms. Many of these irons have been purchased outright by individual soldiers and the Little Rock company has also suggested a scheme whereby the soldiers get together in clubs of five, each contributing $1.00 towards the purchase price of an iron and in this way get their pressing done at very little expense. A large division of men have just been transferred to other camps preparatory to service overseas, and new men are expected at Camp Pike in the very near future, and the Little Rock company is preparing to repeat their campaign to these soldier boys.

NEW EQUIPMENT FOR BARTLESVILLE PLANT.

In order to meet the increasing demands on the electric plant of the Bartlesville Interurban Railway Company, a Doherty property, new generating, condensing and boiler equipment is now being added which will be in service early in the fall. The new equipment consists of a 1250-kw. Westinghouse turbine and LeBlanc jet condenser, a 3600 g. p. m. spray pond and a 300-h.p. Heine boiler. A reserve supply of fuel oil to protect against gas shortage this winter will be made available by the installation of a 3000-barrel steel tank. John Strom from Joplin, Mo., is in charge of new construction work.

PUBLIC SERVICE COMMISSION CANNOT INCREASE RATES.

The Court of Appeals, New York, has handed down a decision denying the right of the Public Service Commission to grant an increase in the gas rate.

Operating

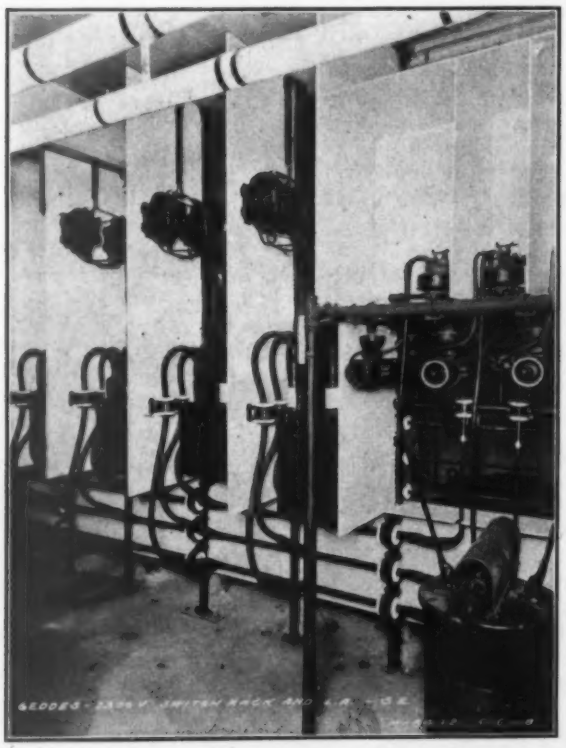
Disconnect Switch Substitute — Circuit Breaker Signals — Cross-Connected Reverse-Power Relays—Cables for Mines

A SUBSTITUTE FOR THE DISCONNECT SWITCH.

Installation of Flexible Conductor for Small-Capacity 2300-Volt Disconnective Purposes.

The Detroit Edison Company is employing for certain purposes a form of construction that is of interest because it saves initial cost, conserves space, and renders greater flexibility more simply than could otherwise be obtained.

There are many instances where it is desired to be able to disconnect apparatus and yet where installing disconnect switches adds materially to the cost. In other instances space is cramped, and it may be difficult or even impossible to find space in which to install the typical disconnect switches. In such cases the Detroit Edison Company uses what is really a substitute



Flexible Conductor Used as Disconnect for Generator Circuit Breakers.

for the disconnect switch although answering the same purpose.

Instead of a disconnect switch a flexible copper conductor with especially heavy insulation is used. This flexible conductor, which comprises part of the circuit, connects to the other part of the circuit through a male and female joint. The male portion of the joint is connected rigidly to one part of the circuit, for example, the bus, while the female section of the joint is connected to the flexible conductor which in turn connects with the circuit or conductor to be connected or disconnected by means of the flexible conductor.

The section of the joint in physical contact with the bus consists of a T-piece through which the bus passes. The T-piece is slipped along the bus conductor and after being pinned in place, is soldered, in this way eliminating voltage drop due heavy current passing through the bus. This type of disconnect in use is shown in the accompanying illustration as applied to two 500-kw. generators at the Detroit Edison Company's Geddes hydroelectric plant on the Huron River. The flexible conductor should, obviously, be connected to the side of the circuit that will be normally "dead" when the disconnection is made, as this prevents the cables being a possible source of short-circuit. The above method of isolating circuits, buses and generators of comparatively small capacity and for voltages around 2300 volts possesses many advantages in the way of simplicity, low cost, conservation of space. Moreover, this arrangement is often more flexible than the switch type disconnect, it being possible to transfer three ways, which is always expensive with the switch-type disconnect. The highly insulated flexible conductor and its joints in any case must always be far less expensive than the knife switch and its insulators and mounting; it is more quickly manipulated and occupies less space.

CIRCUIT BREAKER SIGNAL OPERATION.

Importance of Checking Action of Pilot Lights as Safety Measure.

By W. M. Blythe.

The practice of installing auxiliary contacts to circuit breakers, separate and entirely isolated from the main circuit, to which are connected signal lights or bells, and sometimes both, is a very old custom. The use of red and green lamps on switchboards is as old as is remote control and is almost invariably employed in stations using and generating electricity today.

Occasionally the switchboard signal or "pilot" lights give a wrong indication. Perhaps the auxiliary or signal contacts stick so that although the circuit breaker is in such a position that the main circuit controlled by the circuit breaker is open and the circuit breaker is also open, the red light burns when the green light should do so, and vice versa. To prevent this happening, and thus prevent the mistakes and hazards due improper signals, it is very important that the auxiliary contacts be properly located; secondly, that the contacts be kept in proper condition; and thirdly, that the contacts and the entire signal system be properly installed of the proper materials.

Recently in a large station an operator was preparing to take out of service a large three-phase trans-

former. He opened the transformer circuit breaker on the high-voltage side of the transformer, and on seeing the red lights had turned to green, took it for granted that the breaker had opened. On opening the disconnect a heavy arc was drawn, which held on because of the high voltage and heavy amperage. Space was cramped and the disconnect switches were not as high up as is usually the case. The operator was unable to move away from the arc and suffered such injuries that he died within a few hours.

Had the operator in the present instance, instead of relying upon the circuit-breaker signal, taken the trouble to check up the position of the circuit breaker so as to make sure the switch had opened, the accident would have been prevented and his life would have been saved. It is a good rule to insist that operators check up the position of their circuit breakers by inspection before working on the live parts, not relying on the signal lights.

CROSS-CONNECTION OF REVERSE-POWER RELAYS.

While, in general, transmission and distribution systems can readily be sectionalized by the standard application of overload and reverse-power relays, there are often conditions under which these methods do not suffice. Some of these can be handled readily by a balanced system of relays, two methods of which, the pilot-wire system and the split-conductor system, have been in use for some time. These, however, have their disadvantages, among which are the expense of the additional cables necessary and, in the split-conductor system, the possibility of trouble occurring on both conductors simultaneously, in which case the relays would not clear the trouble.

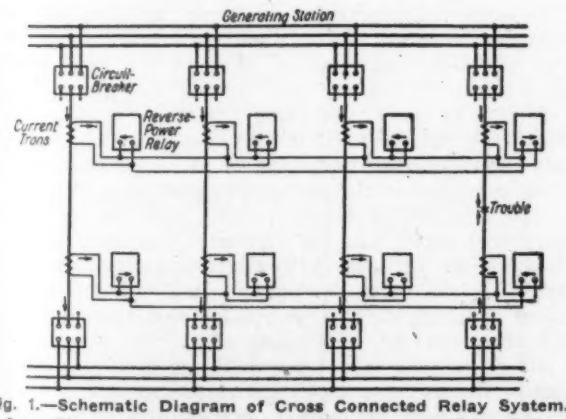


Fig. 1.—Schematic Diagram of Cross Connected Relay System. One Phase Only Shown and Voltage and Trip Coils Omitted. Arrows Show Direction of Power With Short-circuit on Right Feeder at "x."

A later method of balancing relays on parallel feeders, and not having the above disadvantages, is the cross-connection of reverse-power relays.

The schematic diagram of Fig. 1 shows the connections of cross-connected reverse-power relays applied to a system consisting of a generating station and a substation connected by four parallel feeders. To simplify it, the diagram shows one phase only of each of the feeders. A complete diagram of connections for a pair of three-phase feeders (except that the tripping circuit is omitted) is shown in Fig. 2.

By reference to both Fig. 1 and 2, it will be seen that all the current transformers in the generating station are connected in series; likewise, those in the substation; and that each relay, which must be a reverse-power (unidirectional) relay, is shunted across its current transformer.

It should be borne in mind that, while shown in Figs. 1 and 2 for a particular, and comparatively simple, condition, this scheme can be used with equal success in any part of a complicated network. While, preferably, the cables in the parallel system should be alike, if there is a difference in their impedance this difference can be compensated for by simple means.

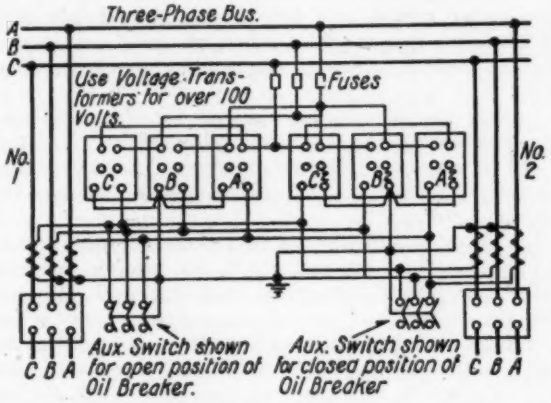


Fig. 2.—Diagram of Cross-Connected CR Relay System. Connections Shown for Three-phase Circuit Except for Trip Coils.

Under normal conditions, the load in each of the cables will be the same and, since the relays have a higher impedance than the current transformers, the current from the latter will therefore circulate through all of them in series without any flowing through the relays. If the trouble occurs at any point outside the section protected by these cross-connected relays, the current through the cables will still be balanced, and, consequently, there is no force tending to operate the relays. On the other hand, if trouble occurs on a cable within the section, the current through the defective cable will be higher than that in the others, and the excess current from its current transformers must, therefore, pass through the relays. While, under this unbalanced condition, current will flow through all the relays, it will be observed that the current is in the proper direction to cause the relay to act only in the relays at each end of the defective cables (see direction of arrows in diagram).

In Fig. 2 are shown pilot switches connected in the transformer secondary circuit. These are, also, connected mechanically to the operating mechanism of the

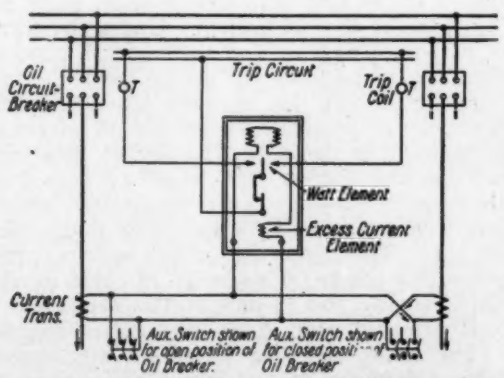


Fig. 3.—Double-contact CR Reverse-Power Relay Applied to Duplicate Feeders. Voltage and Trip Coils Omitted and Connections for Only One Phase Shown.

breaker so that when the breaker opens the current transformers on the feeder controlled will be short-circuited. By this method a cable can be cut out of service without interfering with the electrical balance in the current-transformer circuit.

It will be noticed by reference to Fig. 1 that when the cross-connected scheme is used on only two cables, the two sets of relays are actually in parallel, and are arranged to operate in the opposite directions. The expense of the two-cable cross-connected system can be reduced by using, in place of the two sets of reverse-power relays, one set of special relays having two contacts, one to close when power flows in one direction, and the other, in the reverse direction. (See Fig. 3.)

Among the advantages claimed for the cross-connected system of reverse-power relays are:

(1) It may be applied to any system, no matter how complex, if the feeders are run in parallel between the switching points.

(2) It is practically instantaneous in operation.

(3) It can be set to operate on smaller currents than the full-load current of each feeder. This enables the clearing of trouble on a system having the neutral grounded through such high resistance that the total trouble and load current flowing through a single cable may be less than the maximum-load current of that cable.

(4) It does not require change of adjustments each time generating stations are cut in or out of service.

(5) It is more economical than the split-conductor, or the pilot-wire system, not requiring so much cable.

(6) To avoid the condition arising from trouble occurring at the same time on both conductors of a split-conductor cable, a modified split-conductor scheme, using standard cables but operating them in pairs and disconnecting both in case of trouble on either one, has been tried. Cross-connected reverse-power relays are superior to this method of balancing because they cut out only the bad feeder.

FEEDER CABLES LET DOWN THROUGH DIAMOND DRILL HOLES.

New Leads and Control Panels Being Installed in Deep Copper Mine at Butte.

The Anaconda Copper Company is making some interesting installations at its High Ore mine, at Butte, Mont., with special view to securing greater safety and efficiency. This consists of putting in new feeder and distribution cables and switchboard panel units, supplanting those of the old system. Under the former system of power transmission to the 1200, 2200 and 2800-foot levels, the leads are passed down the operating shaft, a practice that has been attended by danger on account of possible fires and risk to miners and others employed in the mine. To obviate these risks, 3⅛-inch diameter diamond-drill holes have been driven in solid rock, in which to carry the electric cables to the three levels mentioned for operating pumps, blowers and fans. The completion of this system requires 10,000 feet of 3-conductor 400,000 c. m. cable, in which varnished cambric and ⅛-inch lead is used; and the whole is armored with 0.180-inch galvanized steel wire. The cable, including its sheath and armored finish, has a diameter of 2.93 inches, and weighs 16.6 pounds to the foot. It is suspended from a cable bell at the surface and is dropped down through the drill holes, connecting with junction boxes at various stations. In driving the drill holes, locations were selected where the rock formation was free from faults, which was some distance away from the main shaft. The maximum length of cable, let down in any one piece, was 650 feet to a level where connection was made to another cable section leading to a lower level. In this way feeder cables are extended to substations on the 1200, 2200 and 2800-foot levels, on all of which pumps and ventilating fans are operated.

On the 1200-foot level is a station of four pumps, requiring eight 150-horsepower motors, all gear connected. The pump station on the 2200-foot level is practically an exact duplicate of the one on the 1200 level. On the 2800-foot level are three pumps operated by six 150-horsepower motors. These are all old installations, supplied with energy by means of cables passed down through the shaft. This arrangement will give way to connections with the feeder cables that pass down through the diamond-drill holes to the various substations as soon as the new General Electric safety first, truck-type, alternating-current switchboard panels are fully installed at the three levels mentioned.

These General Electric switchboard panel units are designed to reduce the life hazard to the minimum and are of special merit where continuity of service is essential. Each unit contains a steel panel supported by trucks, the panel and instruments being mounted upon the carriage structure. There is also a cubical compartment into which the panel equipment on trucks is wheeled. This contains the permanent buses and cable terminals.

REDUCING CURRENT SURGING OF SPOT WELDER.

A large manufacturing company installed several large spot welders. Energy was purchased from the local central-station company over quite a long 4000-volt circuit. When the spot welder was gotten into operation, its load comprising the major load in the circuit, the voltage variation was so great as to seriously interfere with operation of all other motors on the same circuit in the same plant and other plants.

The spot welder operated directly off the alternating-current supply and the necessity of using a motor-generator set with heavy flywheel was seriously considered as the most obvious, in fact only apparent, way of reducing the intense voltage variations due the fluctuating current. Changing over from alternating to direct current would be costly in any case, considering the use of a motor-generator set and its control, hence effort was made to find some other way out of the dilemma.

What was finally done was as simple as it was effective. The voltage variation was due the current surge, hence if the amperage could be stabilized the voltage regulation would be improved. The amperage was, in fact, stabilized by installing a circuit breaker in parallel with that controlling the spot welder. The two circuit breakers were interlocked so that the one closed practically simultaneously as the other opened. An artificial load, highly reactive, was connected through the auxiliary circuit breaker, this load going on the line as the true welder load came off. In this way the kilovolt-amperes were proportioned so as to be sufficiently of an equality to prevent excessive voltage fluctuation. The one load was largely a watt load, the other chiefly wattless. The kilovolt-amperes, not the kilowatt, were approximately balanced.

Contracting-Construction

A Few Important Facts About Conduit Fishing—Methods of Terminating Heavy Conductors—Among Contractors

A FEW FACTS ABOUT CONDUIT FISHING.

What Fishing Consists of, Why It Is Necessary, When It May Be Omitted, and How Conduits Are Identified.

By Terrell Croft.

[*This is the first of seven articles by this well known author in which he discusses the best methods and equipment for fishing conduits. On account of the increasing use of interior conduit systems, this matter is becoming increasingly important.*]

The Essential Steps in the Installation of a Conduit Wiring System are these:

(1) Laying out the work from the plans and specifications;

(2) Installation of the conduit tubing and the steel distribution, outlet, and junction boxes;

(3) Fishing the ducts;

(4) Pulling in the wires—(this is sometimes done with a fish wire);

(5) Making the splices;

(6) Soldering and taping the joints;

(7) Grounding—that is, permanently electrically connecting the conduit system to some grounded member within the structure in which the conduit system is installed.

After the work above specified has been completed, it being assumed that the building construction is then sufficiently far advanced, the distribution panels and cutouts are placed; the fuses are mounted in them; the circuit wires are connected to the cutouts and panel lugs; the lighting fixtures and the wall switches and receptacles are now installed and connected; then the

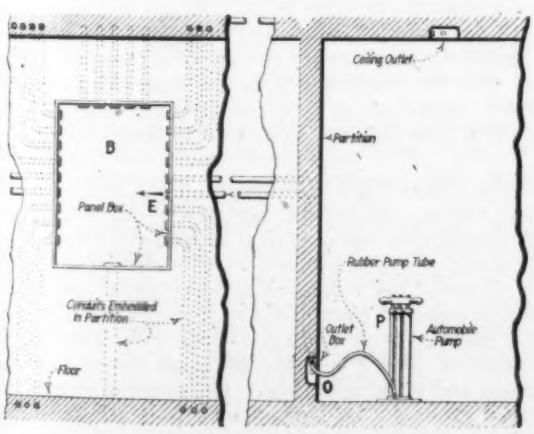


Fig. 1.—Method of Tracing Conduit Runs With Pneumatic Pressure From a Common Foot Pump.

service connection is effected and the installation is complete and ready for operation. Two inspections are usually provided for, one after the roughing is completed and the second when everything is finished and ready for the service connection.

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Methods and Appliances Used in Fishing Conduit will be treated in this series of articles. That is, in them will be described the operations which are executed immediately after the conduit system is completed and preparatory to "pulling in" the insulated conductors which will distribute electrical energy to the various receiving devices.

"Fishing" May Be Defined as the process of forcing a wire-tape or cord (a "fishing line") from one outlet to another, through the ducts of a conduit system, whereby the relatively flexible insulated copper conductors can be pulled into the ducts either with the wire or cord used in fishing or with a stronger flexible line (a "pulling-in line") which is pulled in with the wire or cord. "Fishing" is, in England, called "threading."

Note that the National Electrical Code Rule 28*c* specifies that interior conduits "must be first installed as a complete conduit system without the conductors." In other words, the contour and layout of conduit runs must be such that the conductors can be inserted or withdrawn at any time. The reasons why this requirement is a wise one are given in full in connection with the discussion of Rule 28*c* in the author's book on "Wiring for Light and Power." In substance, they are as follows: If the wires are placed in the conduits prior to completion of the building there is always the possibility that they may be damaged or cannot be withdrawn; joints in the conduit system would very likely be poorly made if the wires were present.

Fishing the Conduit Is Not Always Necessary. The No. 14 solid rubber-insulated twin* wire which is used widely in this country for branch circuits in conduit systems can often of itself be forced from outlet to outlet through short and relatively straight conduit runs. However, the instances in which this procedure can be followed advantageously are comparatively few. Where there are more than one or two bends in a run it is, in nearly every case, more economical to first fish the run than to endeavor to force the copper wire unaided through the tube.

For Some Installations the Specifications Require That a Pulling-in Wire Be Left in the Duct in Which the Conductors Are Not to Be Installed Immediately. Some of the specifications used by the supervising architect of the Treasury Department of the United States for Post Office and other Federal buildings contain this requirement. For example, the specifications for the Minneapolis Post Office contain on page 46 the following clause:

"The entire conduit system is to be installed complete before any conductors are drawn in. Every run of conduit is to be fished before the plastering is finished, to guard against obstructions and omissions. No. 14 galvanized iron or steel fish wire is to be left in all conduits in which the conductors are not placed under this contract."

*Twin wire is defined by the United States Bureau of Standards as "two small insulated conductors laid parallel, having a common covering." This wire is also often called "duplex" wire.

The intent of this provision is to insure that every run will be continuous and unobstructed from outlet to outlet when the contractor leaves the job. Where a run is obstructed and it is necessary to tear down plastering or portions of walls to remove the obstruction, this can be done much more economically while the building is being constructed. Furthermore, it is obviously a duty of the conduit contractor to provide clear wireways.

Identifying the Two Outlets of Each Conduit Run is one of the first steps preparatory to fishing; that is, the wireman should know at what outlet each of the runs from the distribution box at which he is working terminates. When, as often occurs, there are many conduits entering the same distribution box, it is sometimes difficult to identify in the box the certain conduit which it is desired to fish which extends from some outlet in a distant room to the box. One of the best methods of thus locating the given conduit is that described in the following paragraph.

A Pneumatic Method of Conduit-Run Identification Is Described Graphically in Fig. 1. It is desired to know which of the conduits terminating in the panelbox *B* extends from outlet box *O* in a distant room. This conduit run *OE* can be identified by inserting the hose of an air pump *P* into the mouth of the conduit in the distant room, as shown in the illustration, and then operating the pump. Meanwhile the wireman's helper passes his thumb successively over the mouths of all the tubes which enter *B* and can thereby easily detect, by virtue of the escaping air, the one through which *P* is creating a pressure. Sometimes it is advisable to moisten the thumb, when holding it over the holes in the bushings, so that the conduit sought may be more readily identified. While the thumb will cover the hole in a bushing of a one-half-inch conduit, it will not close the orifice of bushings for conduits of the larger diameters. Hence, for these larger-diameter tubes, a piece of cardboard large enough to cover the bushing orifice should be provided. Then in this cardboard disk a one-half-inch-diameter hole which the thumb can easily cover should be pierced. To identify a conduit with the cardboard disk it is held with the thumb over the hole in it in succession over the different conduit ends in the distribution box.

(To be continued.)

METHODS OF TERMINATING HEAVY CONDUCTORS.

By Richard F. Mitchell.

A heavy conductor used for open wiring can be terminated as shown in Fig. 1. The conductor is

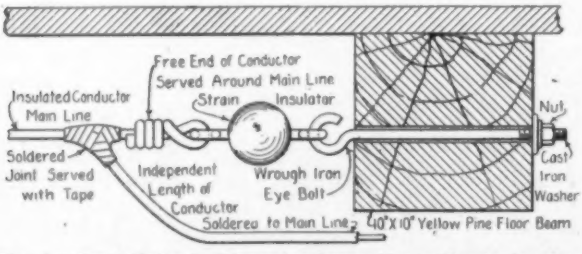


Fig. 1.—Good Method of Terminating a Heavy-Conductor Run.

passed through the eye of a strain insulator and its end brought back and wrapped several times around the main line. The opposite eye of the strain insulator in which the conductor does not engage should be attached to a hook or eye bolt or the hook of a turnbuckle. The hook bolt or turnbuckle is provided so that the heavy conductor can be drawn taut.

Where heavy-conductor runs must make right-angle turns, it is frequently the case that cable clamps can be utilized advantageously as shown in Fig. 2 for

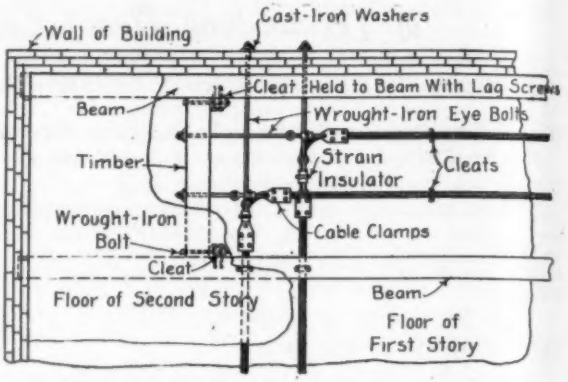


Fig. 2.—Method of Making a Right-Angle Turn in Heavy Wires or Cables.

supporting the runs at such turns. Each of the cable clamps is, of course, insulated from the bolt which supports it by a porcelain or composition strain insulator, as indicated in the illustration. Where right-angle turns must thus be made in heavy-conductor runs, experience has shown that the application of cable clamps, as illustrated, provides by far the most economical method of making such turns.

AMONG THE CONTRACTORS.

In connection with the erection of the large new plant of the West Virginia Pulp & Paper Company comprising eight manufacturing units at Mechanicsville, N. Y., to cost in the neighborhood of $350,000, contract for electrical work has been awarded to the J. Livingston & Company, Inc., 70 East Forty-fifth Street, New York City.

G. L. Craig & Company, Pittsburgh, Pa., have been awarded the contract for the electrical work in connection with the construction of the new Dormont public school auditorium to be erected by the Board of Education of that city at a cost of about $60,000.

The Great Falls Electric Supply Company, Great Falls, Mont., within the last few months, completed the installation of electrical equipment of the mine of Mackton Coal Company, in Chouteau county, near Big Sandy, that state. The equipment comprised a 120-horsepower electric hoist for operating in a 400-foot incline, with a 12-ton skip; two 1500-kilowatt generators, and a number of small motors for fans, pumps and shaking screen. The generators are steam driven from the coal company's four 100-horsepower boilers. Another contract carried through was the installation of the electrical equipment in the new addition of the Royal flouring mill at Great Falls. Central-station power is used, and the motors aggregate 475 horsepower. One 350-horsepower motor is directly coupled to the main mill line shaft; other motors are connected by chain drive to the machines they operate. This company is wiring the new substation building of the Montana Power Company at Great Falls.

New Appliances

Peirce Wireholders—Adjustable Alining Plate for Hubbell Receptacles—Recording Demand Meter—Marine Fixtures

THE PEIRCE ECONOMICAL, CONVENIENT AND SAFE WIREHOLDER.

Built for permanence, which means built so as to be safe, reliable, of minimum deterioration under the influences of abuse, time and the elements, yet inexpensive, installed with little trouble, with a minimum of labor. These are some of the things accomplished by using Peirce hardware for distribution and transmission line construction. There are other advantages, such as extreme flexibility in use of apparatus; keeping down stocks to an absolute minimum, since the same piece of equipment may be used for several different purposes; high reclamation value because the same material may be used over and over again if necessary, and so on.

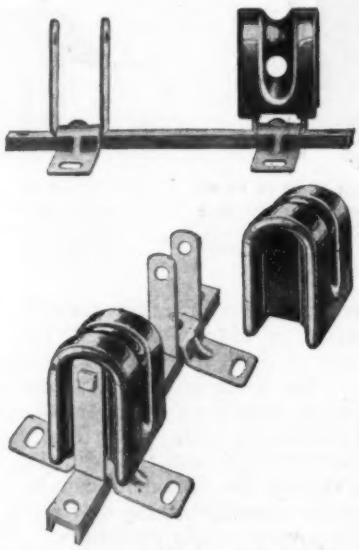


Fig. 1.—Details of Peirce Wireholder.

Pole line construction, in fact, general distribution by overhead conductors, however carrier, whether on poles, along walls, under ceilings, and so forth, faces many difficulties at present. Labor is scarce and the work must usually be carried on short-handed. Material delivery is uncertain, hence it is imperative to use as widely as possible that obtainable.

The above are some of the reasons that have caused Hubbard & Company, Pittsburgh, Pa., to bring out a line of distribution and transmission line hardware, each a time and labor saver, each a contribution toward making electrical distribution safer, cheaper and more reliable, each assisting conservation of time, materials and men, while enabling service of a higher degree of continuity.

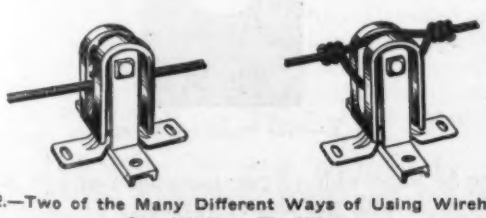


Fig. 2.—Two of the Many Different Ways of Using Wireholder, One Without Tie Wires.

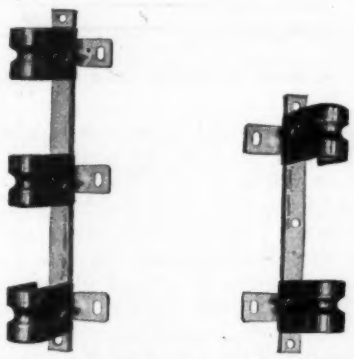


Fig. 3.—Wireholder Mounted on Galvanized Bracket, Making Two and Three-Unit Bracket.

The Peirce wireholder is claimed to be a notable achievement in economy, convenience and safety. Its cost is the lowest of any wall bracket on the market; it takes less time to attach to a wall and string a wire, which may be done without tie wires than any other bracket; it virtually eliminates renewal costs, because the wireholder is practically indestructible; inspection and adjustment costs are absent because there is nothing to get out of order; for the same reasons service interruptions are obviated. The Peirce wireholder is universal in its application, for all positions, adfixed to brick or wood or concrete. The wireholder is able to carry 350 pounds wire stress in any direction with working voltages up to 500 volts.

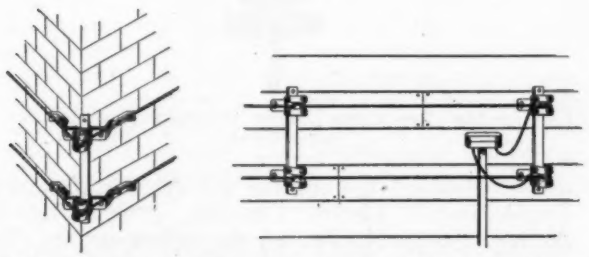


Fig. 4.—Two of the Commoner Uses of the Peirce Wireholder.

The make-up of the Peirce wireholder is shown in Figs. 1 and 2. There are no bending strains. All metal is in tension; all porcelain in compression. The insulator is electrically correct, drains readily in all positions and has high dielectric strength as well as high creepage surface. All metal is hot galvanized by

the Hubbard process. An open end wall plate prevents ice from forming under the plate and thus forcing the holder from the wall. Ample clearance exists between porcelain and metal, the insulator is practically unbreakable and quickly replaceable without interfering with the bracket itself. Fig. 2 shows the wireholder in use in two different ways, one without the wires.

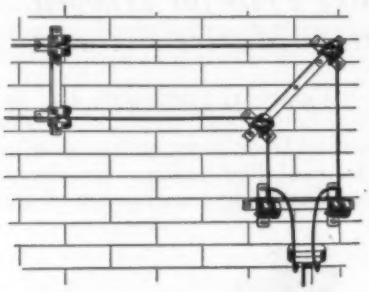


Fig. 5.—A Peirce Wireholder Used in Another Way.

Fig. 3 shows a two and three-unit bracket, and Figs. 4 and 5 illustrate three of the commoner uses of the wireholder on walls.

Another of the Peirce wireholder family, known as the "one-ninety" (190), follows the same general design as the ones described and illustrated above, but is screwed into its support instead of being bolted to a bracket. It forms both bracket and insulator. The "one-ninety" will do everything a house bracket or a swinging knob will do, only does it cheaper and better. No tools are required, it being necessary to only press the screw to the wood to make a small hole and then turn the unit to screw it in. Altogether there are seven different types of these Peirce wireholders designed for single and multiple wire circuits and fix-

Fig. 6.—The One-Ninety Peirce Wireholder—"Used Like a Screwdriver."

tures. Hubbard & Company are the manufacturers. Doubleday-Hill Electric Company, 719-721 Liberty Avenue, Pittsburgh, Pa., are the selling agents. The wireholders have been developed, in addition to the other many lines of transmission and distribution hardware manufactured by Hubbard & Company, to fill a place, the many places, where a universal, flexible, inexpensive insulating support is required.

EMPLOYMENT OF CRIPPLES BY UTILITIES.

The Colonial Power & Light Company at Cavendish, Vt., and the Claremont Power Company, Claremont, N. H., are employing respectively a one-armed man as a load dispatcher and a lame man as a powerhouse operator.

These men are found to be efficient, and their misfortunes no bar to their work. As the men are able to do work none the worse for being cripples, their rate of remuneration is that of those with all limbs.

ADJUSTABLE ALINING PLATE FOR HUBBELL FLUSH RECEPTACLES.

The present movement for installation of convenient wall and floor outlets, which bids fair to stimulate the use of portable lamps, fans, heating devices and other electrical appliances, makes it timely to describe an important development for making it much easier to install flush wall receptables. Outlet boxes for wall switches and receptacles, as now commonly used in new buildings with interior conduit systems, are intended to be installed so that the box opening shall come flush with the plaster line. Unfortunately, this result is seldom obtained in actual practice, in fact in most cases the box is sunk considerably back of the plaster surface. This has necessitated some means of raising the receptacle, which usually has been done by some makeshift means, such as use of washers, tubing, blocks of wood, or any other object that was readily available to the wireman.

Fig. 1.—Front View of Flush Receptacle With Adjustable Alining Plate.

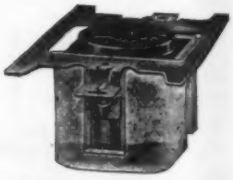


Fig. 2.—Side View of Receptacle Showing Construction of Adjustable Lugs and Slides.

To overcome these difficulties there has been placed on the market by Harvey Hubbell, Inc., Bridgeport, Conn., a type of flush receptacle with adjustable alining plate. This is shown in the accompanying illustration, Fig. 1 showing a top view of the receptacle itself and the alining plate, while Fig. 2 shows a side view of the receptacle and the adjusting means used. Fig. 3 is a view of the face plate usually supplied with the receptacle. To attach these new receptacles to outlet boxes is a very simple procedure. The receptacle is inserted in the box until the alining plate is flush with the plaster surface. The set screws in the lugs are then loosened and the lugs pushed back until they rest on the outlet box. The set screws are then tightened until the lugs are securely fixed. Finally, the outlet-box screws are fastened through the lugs. Thus, the entire operation results in a receptacle installed so

Fig. 3.—Face Plate for Receptacle.

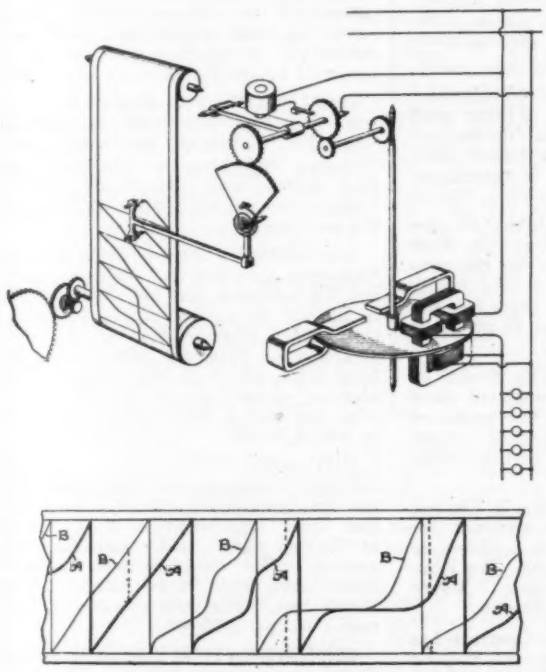
as to be impossible of any movement and so as to be fully flush with the plaster surface.

It is obvious that the installation of this type of

receptacle requires no more time than would be needed if the outlet box had been properly installed flush with the plaster. The use of this type of receptacle therefore not only permits a much neater and more satisfactory installation but one that can be installed at substantially no increased cost.

MEASURING ELECRIC DEMAND.

An interesting device for positively recording the maximum electrical demand during any given interval of time is described in United States Patent No. 1,269,525, recently issued to James R. Craighead, of the General Electric Company, Schenectady, N. Y. It is a graphic instrument in which two pencils are simultaneously moved across a clock-driven strip of paper, the pencils being automatically returned for fresh starts. Both pencils being moved in unison, the result (as shown in our illustration) is a pair of parallel rec-



Unique Method of Measuring and Recording Demand and Enlarged View of Record Strip.

ords spaced from each other by a distance corresponding to the time in which the clock would drive the paper the same distance. Consequently, the transverse distances between the two lines, some of which are dotted in our illustration, will indicate the demand at any given moment and the time of the peak demand can easily be located.

BENJAMIN MARINE FIXTURES.

With the development of the shipbuilding industry in America, the Benjamin Electric Manufacturing Company, Chicago, Ill., began to offer to ship builders a very complete line of marine lighting and signaling apparatus, most of it being watertight and designed and made strictly for use under severe conditions aboard ship.

Some typical devices being produced by this company include water-tight boxes, for use with various types of receptacles, switches and connecting blocks.

Also there is a line of water-tight marine lighting fixtures, both in deck and bulk-head installation. Some of the interior parts of these have features of special interest. In addition to this the Benjamin Company is furnishing the merchant marine and navy with signaling apparatus, consisting of buzzers, bells and buttons, all of water-tight construction. The Benjamin Company's wide experience in manufacturing lighting and signaling apparatus for oil refineries and flour mills qualifies it for the extraordinary demands for marine devices at this period. The Benjamin marine line is built up around certain basic parts in order to provide the uttermost interchangeability. Boxes, covers, globes and rings are standardized, and the spacings for supporting screws on receptacles and switches are in accordance with standard spacing of mounting bosses on various junction boxes and fixture bodies.

The Benjamin reputation for making quality things has done it all as a part of the national effort to speed up shipbuilding.

MICANITE INSULATION FOR COMMUTATORS.

The insulation of commutators has been given study since these became an integral part of electrical machinery. Soon after difficulties developed with the makeshift insulation used at first, reliance was placed on mica, but various experiences were met with due to difficulties in selecting the proper grade of mica and of handling it effectively so as to form proper insulation between commutator bars. About 1892 micanite was placed on the market by the Mica Insulator Company to overcome the difficulties formerly met in handling natural mica.

Micanite is carefully selected amber mica which is subdivided so that it constitutes films of minute thickness which are then reassembled into a consistent whole. These thin films are fastened together by insulating cement by the application of heat and pressure. The Micanite plates are large sized sheets of relaminated, superimposed layers of thin split mica sheets, the average area of which is at least three square inches. An excellent discussion of mica insulation of commutators is contained in a booklet just issued by the Mica Insulator Company, 68 Church Street, New York City, from whom copies can be obtained by those interested.

REAL OPPORTUNITY FOR ELECTRICAL GOODS IN CHILE.

Of all the countries on the West Coast of South America, Chile offers the best opportunity for the immediate sale of electrical goods and the prospects for the future are even brighter. To assist the American manufacturer and exporter to take full advantage of this opportunity the Bureau of Foreign and Domestic Commerce is now distributing a report by Special Agent Philip S. Smith, who has just completed an investigation on the ground.

As late as 1915 Germany sold more electrical goods in Chile than did the United States. We have improved our position since then, but we are not yet fully prepared to hold on when the war is over. The report discusses ways and means of holding on.

Copies can be obtained by application to the Superintendent of Documents, Government Printing Office, Washington, D. C.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

CLAREMONT, N. H.—Claremont Power Company has been granted by the Public Service Commission of New Hampshire and Vermont, an increase of one mill per kilowatt for electric service, the increase to effect only large consumers.

RUTLAND, VT.—Rutland Railway, Light & Power Company has completed negotiations with the War Industries Board for the use of the waters of Bomoseen Lake, amounting to approximately 700,000,000 cubic feet for power purposes.

BOSTON, MASS.—New England Power Company, 50 Congress street, has had plans prepared for the construction of a brick addition to its steam power plant at Uxbridge. The Harry M. Hope Engineering Company, 185 Devonshire street, Boston, is engineer.

BROCKTON, MASS. — Walk-Over Shoe Company is having preliminary plans prepared for the construction of a power house at its local plant. Jenks & Ballou, 735 Grosvenor building, Providence, R. I., are engineers.

SHERBORN, MASS.—Plans have been prepared for the construction of a large power plant at the Sherborn Reformatory for Women, to cost approximately $70,000. Mrs. Jessie D. Hodder, superintendent.

BROOKLYN, N. Y.—Kings County Lighting Company, 4802 North Utrecht avenue, is said to be planning to maintain and operate a toluol recovery plant for the Government. The works will cost in the neighborhood of $200,000.

BROOKLYN, N. Y.—Estey Brothers Company, 270 Union avenue, manufacturer of electrical wires, etc., has leased the four-story building at 34 Cliff street for a term of years at an aggregate rental of approximately $150,000, and will use the structure for a new works.

BUFFALO, N. Y.—Hydraulic Power Company is making extensions in its plant and system to increase its capacity for supplying additional power to large plants in the vicinity engaged in Government contract work. Bonds for $1,500,000 have just been sold by the company, the proceeds to be used, in part, for the extensions.

CANISTEO, N. Y.—Canisteo Light & Power Company is negotiating with the Hornell Light & Power Company for electricity for street lighting.

GALVAY, N. Y.—Plans for the erection of an addition to the power plant at the Saratoga County Homestead Sanitarium, to cost $12,000 are under advisement by the board of managers.

NEW YORK, N. Y.—Sibley Pitman Electric Corporation, 19 West Thirty-sixth street, has leased property at 190-96 Sixth avenue, at an aggregate rental of about $125,000, to provide for increased operations.

NEW YORK, N. Y.—Sundh Electric Company has increased its capital from $120,000 to $170,000. Thomas M. Belknap, secretary, 578 W. Twenty-third street.

ROCHESTER, N. Y.—A petition for authority to make a refunding and improvement mortgage and to issue $3,900,000 in 7 per cent three-year bonds has been filed by the Rochester Railway & Light Company with the Public Service Commission. Address general manager.

ROCHESTER, N. Y.—Bridgeford Tool & Machine Works, Winton road north, is considering plans for the immediate construction of a power plant at its works to provide increased capacity.

PHOENIX, N. Y.—John Dunlop Sons Company, 254 Fifth avenue, New York, is considering plans for the construction of a one-story power house, about 50x50 feet, to be used for the operation of the proposed plant to be erected by the company.

SYRACUSE, N. Y.—The Board of Contract & Supply has completed plans for the construction of the proposed one-story pumping station to be located on Fellows avenue. H. C. Allen is city engineer.

UTICA, N. Y.—Utica Gas & Electric Company has awarded a contract for the construction of a new addition to its plant to cost about $12,000. The Kimberly Construction Company, Mayro building, Utica, is the contractor.

BLOOMFIELD, N. J.—Contract has been awarded by the General Electric Company, Schenectady, N. Y., for the construction of a brick boiler plant at its local works, to cost about $10,000. The Salmond Brothers Company, 526 Elm street, Arlington, is the contractor.

BROWN MILLS, N. J.—The Board of Public Utility Commissioners has granted approval to the application of the Brown Mills Electric Light & Power Company for permission to take over the plant of the Brown Mills Company, for a consideration of about $10,000.

CALDWELL, N. J.—In connection with the development of the new Government rifle range at Great Piece Meadow by the War Department, plans are under consideration for the installation of an electric street-lighting system.

DOVER, N. J.—New Jersey Power & Light Company has recently inaugurated operations in a 500-horsepower boiler at its plant, to provide for increased capacity. The company is negotiating with the International High Speed Steel Company, Rockaway, for supplying additional power to the amount of about 50,000 kw. h. per month, 150,000 kw. h. per month being supplied at the present time.

HOBOKEN, N. J.—The United States Government, Thirty-second Naval District, New York, has awarded a contract to the F. G. Fearon Company, 280 Madison avenue, New York, for the construction of a local power house, to cost $19,400.

NEWARK, N. J.—Northern Feather Works & Produce Company, Inc., 377 Broadway, New York, is rushing to completion the construction of the new power house at its local plant on Backus street. It is expected that the structure will be completed at an early date.

HAZLETON, PA.—Harwood Electric Company, operating in Carbon, Schuylkill, Columbia, Northumberland, Montour and Luzerne Counties, has filed notice with the Public Service Commission of an increase in its rates for service.

NICETOWN, PA.—Midvale Steel & Ordnance Corporation, Widener Building, Philadelphia, has awarded contract to Barclay-White & Company, 1713 Sansom street, Philadelphia, for the construction of extensive additions to its local plant, including the erection of an electric station, about 55x120 feet in size, the entire work being estimated to cost $750,000.

PHILADELPHIA, PA. — Atlantic Refining Company has filed plans for the construction of a large boiler plant and other improvements at its works at Twenty-eighth street and Passyunk avenue. The structure will be one-story brick, steel and concrete, about 60x95 feet. The entire work is estimated to cost $350,000.

PHILADELPHIA, PA.—The United States Government, Bureau of Yards & Docks, has had plans prepared for the construction of a submarine battery building to be located at the local navy yards. The structure is estimated to cost approximately $125,000, and will be one-story, brick and steel, about 90x340 feet.

PHILADELPHIA, PA.—The United States Government, Bureau of Yards & Docks, has had plans prepared for the construction of a two and one-half story brick, steel and concrete extension to the power plant at the local navy yards, about 35x100 feet in size.

POTTSTOWN, PA.—The United States Government has commandeered the old electric light plant of the Philadelphia Suburban Gas & Electric Company here. It will be dismantled and the machinery sent to France. The same thing has been done to the Phoenixville plant, the equipment of which will be sent to one of the Government's power stations in the South.

CUMBERLAND, MD.—Contract has been awarded to the Edison Electric & Illuminating Company for supplying

power for the operation of the large plant of the American Celluloid & Chemical Manufacturing Company, Ltd., now in course of construction near Cumberland.

WASHINGTON, D. C.—In connection with the appropriation recently authorized amounting to $500,000,000, to be used by the Railroad Administration for extensions, improvements, etc., a total of $2,313,000 has been expended to date for electric power stations, and $2,670,000 for interlocking plants and signal systems.

SEVEN PINES, VA.—In connection with the construction of the large bag loading plant of the Government, a large electric-lighting system will be installed.

MOOREFIELD, W. VA.—The city has had plans prepared for improvements in the municipal electric-lighting system.

WHEELING, W. VA.—The street lighting commission and the Wheeling Commercial Association have planned improvements to the street lighting system.

ANDERSON, S. C.—Orr Mills contemplates the establishment of an electric light plant for the mill village.

CHERAW, S. C.—Cheraw Underwear Company is planning for the installation of the necessary electrical equipment for the operation of the new two-story plant recently acquired.

CHESTERFIELD, S. C.—Teal Light & Power Company, recently incorporated with a capital of $10,000, is planning for the early operation of its power plant of 300-horsepower capacity. The company is also arranging for the construction of a six-mile transmission system. J. Newton Johnson, Wilmington, N. C., is engineer.

HONEA PATH, S. C.—Chiquola Mills contemplate establishing an electric light plant for the mill village.

WAUCHULA, FLA.—The city has authorized a bond issue for $24,000, to provide for the purchase of the local electric plant. Lewis Carlton is chairman of the bond trustees.

NORTH CENTRAL STATES.

NORWALK, OHIO. — The City Council will issue $25,000 in bonds for the purchase of a 500-kilowatt generator for the municipal light plant. A big increase in business makes the machine necessary.

VAN WERT, OHIO.—The department of public works of the city is considering repairing the electric lighting plant at the waterworks plant and has not been in use for several years, and fitting it for lighting the city hall. It is thought a substantial saving may be made for the citizens by making the electricity for city hall use instead of buying it from the company that is furnishing light and power in the city.

ANGOLA, IND.—Indiana Utilities Company has filed a petition with the Indiana Public Service Company, asking permission to sell a railroad operating between Angola and Lake James (Ind.), a summer resort. The railroad has not been a paying proposition and the company wishes to abandon or sell it.

DECATUR, IND.—The City Council has passed an ordinance authorizing the extension of the electric lighting system to the town of Bolo and Pleasant Mills, southeast of Decatur. The lines from the city limits to the towns will be built by the Pleasant Mills Light & Water Company.

DATES AHEAD.

Association of Iron and Steel Electrical Engineers. Annual convention, Southern Hotel, Baltimore, Md., September 9-14. Secretary, John F. Kelly, McKeesport, Pa.

Northwest Electric Light and Power Association; affiliated with N. E. L. A. Annual convention, September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

Michigan Section, N. E. L. A. Annual convention, Pantlind Hotel, Grand Rapids, Mich., September 17 and 18. Secretary-treasurer, Herbert Silvester, Monroe, Mich.

International Association of Municipal electricians. Annual convention, Atlanta, Ga., September 24-27. Secretary, Clarence R. George, Houston, Tex.

New England Section of the National Electric Light Association. Annual meeting, Hotel Kimball, Springfield, Mass., September 27 and 28. Secretary, Miss O. A. Bursiel, Boston, Mass.

American Electrochemical Society. Fall meeting, Princeton, N. J., September 29 to October 1. Secretary, Prof. J. W. Richards, Lehigh University, Bethlehem, Pa.

American Electric Railway Association. Annual meeting, Atlantic City, N. J., October 8 and 9. Secretary, E. B. Burritt, 8 West 40th street, New York City.

Illuminating Engineering Society. Annual convention, New York City, October 10. General secretary, Clarence L. Law, Irving place and 15th street, New York, N. Y.

Jovian Order. Annual convention, Dallas, Texas, October 24-25-26. Mercury, Ell C. Bennett, 1415 Syndicate Trust building, St. Louis, Mo.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kans.

CAMERON, ILL.—East Line Power house of the Rock Island and Southern Railways was destroyed by fire, with a loss estimated at $75,000.

EAST ST. LOUIS, ILL.—East St. Louis & Suburban Railway Company has made an appeal to the Illinois Public Utilities Commission for an emergency increase in fares, asking for a 7-cent cash fare or a six cent ticket fare. It is said that the desired increase in fare rates will add between $150,000 and $160,000 annually to the company's income. Operating expenses for this company have increased 45 per cent, amounting now to $180,000 annually.

EAST ST. LOUIS, ILL.—The Illinois Public Utilities Commission has granted a six-cent rate for local street cars of the East St. Louis Railway Company.

GALESBURG, ILL.—The power house of the Rock Island Southern Railroad Company, operating between Rock Island and Galesburg, burned, the cause being due to defective wiring. The building and equipment were entirely demolished. Power has been secured from the Galesburg Street Railway & Lighting Company, a subsidiary of the Illinois Traction System. The road is again operating with only a partial loss of schedule. The fire affected only that part of the road between Galesburg and Monmouth. There has been a rumor that steam would be substituted for electric power on this line, but this is without foundation.

MATTOON, ILL.—An important decision has been rendered by the Illinois Public Utilities Commission giving the Central Illinois Public Service Company increased rates for electric service in 148 communities in Central and Southern Illinois. The residence and commercial rate is increased 1 cent per k.w. hour by the order. The commission declined to agree to an increase in municipal rates. Power rates are increased approximately 15 per cent. The heating and cooking rate is increased 15 per cent.

REPUBLIC, MICH. — Cleveland-Cliffs Iron Company is planning for the construction of a local power house for the operation of its plant on the Dead river.

MANITOWOC, WIS. — The City Council has appropriated $57,596 for the purchase of additional equipment for the utility plant and has directed the utility commission to close contracts for the work at once. The equipment include one 1500 kw. turbine, a 300-horsepower boiler, switchboard, etc., and is installed to increase the capacity of the plant to meet demands upon it. Contracts for most of the above equipment have already been let.

CRESTON, IOWA.—The Creston electric light plant was damaged by fire recently.

LE MARS, IOWA.—Iowa Light, Heat & Power Company will erect a transmission line to connect with the power plant outside the city limits.

OTTUMWA, IOWA.—Twenty-three horsepower in motors has been added at the plant of the Nichols Manufacturing Company by the Ottumwa Railway & Light Company.

SPRINGFIELD, MO. — Springfield Gas & Electric Company is having plans prepared for the construction of a local electric plant to provide for increased operations. Sanderson & Porter, 82 William street, New York, are architects and engineers.

KIMBALL, NEB.—$17,000 electric light bonds have been voted. Address city clerk.

MADISON, S. DAK.—The electric light and water plant was recently destroyed by fire, causing a loss estimated at $100,000. The plant will be rebuilt.

FARGO, N. DAK.—Rose & Harris, engineers, 471 Auditorium building, Minneapolis, will prepare plans for the construction of a power house for the University at Fargo.

SOUTH CENTRAL STATES.

CENTRAL CITY, KY.—Illinois Central Railroad is planning for the construction of a one-story brick power house and machine shop in connection with the proposed extensions in its local terminal facilities.

FLORENCE, ALA. — The United States Government has broken ground on the construction of the large dam on the Tennessee river at East Florence. The new dam will be about 4800 feet long, and is estimated to cost, with

power house equipment, in excess of $20,000,000. A total of 660,000 hydroelectric horsepower will be developed, of which 260,000 horsepower will be required for the operation of the two large Government nitrate plants.

NEWPORT, ARK.—Arkansas Light & Power Company of Newport will build a transmission line and furnish electricity to Tuckerman. Tuckerman has already an electric plant, but it will be more economical to secure the current from the Arkansas Light & Power Company. The city of Newark, located about 14 miles from this place, will also be furnished with electric current.

PONCA CITY, OKLA.—The city will expend $75,000 for improving the light and water system. The specifications include engine and generator, small concrete reservoir, etc. Address G. C. Johnson, city clerk.

ELECTRA, TEX.—$25,000 will be expended for light and water equipment. Address mayor.

WESTERN STATES.

STERLING, COLO.—Colorado Power Company is considering plans for the construction of a large electric power plant on property comprising about five acres recently acquired. It is said that the plant is estimated to cost about $150,000.

SEATTLE, WASH.—The city has been granted permission by the Capital Issues Committee to issue bonds for $5,500,000, the proceeds to be used for the construction of large hydroelectric power stations on the Skagit river to generate power for the operation of local and nearby war plants.

FRESNO, CAL.—San Joaquin Light & Power Corporation has been granted permission by the Railroad Commission to issue bonds for the amount of $113,000, to be sold at not less than ninety per cent of the face value, the proceeds to be used for improvements in its plants and extensions in its system.

RICHMOND, CAL.—A brick company is adding 50 horsepower in motors to its power installation, current for which is furnished by the Richmond division of the Western States Gas & Electric Company. The Standard Oil Company has 400 men at work constructing a new plant at its Richmond establishment, for the manufacture of benzoil.

SAN DIEGO, CAL.—San Diego Consolidated Gas & Electric Company has filed application with the Railroad Commission for permission to issue securities to the amount of $483,700, to provide in part for extensions and improvements in its plant and system. Of this fund, an appropriation of $214,450 will be made for additions and improvements in its electric department and $126,400 for its gas department.

SANTA BARBARA, CAL. — The City Council is considering plans for the early installation of an electric street-lighting system on Anapamu street, commencing at State street and extending to Anacapa street.

VINA, CAL.—Fire recently destroyed the electric pumping plant at the Boyle camp on the Stanford properties, including a quantity of machinery. The loss to the pumping plant alone approximated $10,000, while the entire loss aggregates $50,000.

INCORPORATIONS

DOVER, DEL.—Moorhead Radio Corporation. Capital, $1,000,000. To manufacture electrical and magnetical apparatus. Incorporators: F. A. Armstrong, C. L. Rimlinger, and B. A. Spangler, Wilmington.

JACKSON, MISS.—Mississippi Electric Company has been incorporated with a capital of $15,000 by J. J. Murphy and T. B. Gaddis.

COLLINGSWOOD, N. J. — Goff Manufacturing Company. Capital, $250,000. To manufacture electric and pneumatic brakes, etc. Incorporators: O. P. Wheaton, and F. H. and Howard E. Goff.

ROCHESTER, N. Y. — Rochester Main Electric Company has been incorporated with a capital of $15,000, to carry on a general electric business. Address Paul E. Illman.

MEYERSDALE, PA.—Wellersburg Electric Company. Capital, $25,000. To operate a local plant for the generation and distribution of electric energy. F. E. Rowe is the principal incorporator.

PHILADELPHIA, PA. — Electric Welding & Ship Repairing Company of Pennsylvania. Capital, $50,000. To operate a general electrical repair establishment. J. Kjekstad, of New York, is the principal incorporator.

PROPOSALS

HYDRAULIC TURBINE. — Bids will be received by the United States Reclamation Service, Department of the Interior, Denver, Colo., until October 1, 1918, for furnishing a 5000-kilowatt vertical hydraulic turbine and generator.

GENERATING SETS.—Bids will be received by the Lighthouse Superintendent, 341 Post Office Building, Detroit, Mich., until August 27 for 3½-kilowatt electric generating sets for Keweenaw Waterway Light Station.

ADDITIONS TO CENTRAL HEATING PLANTS, ETC.—Bids will be received at Albany, N. Y., until 2:30 p. m. August 29, for additions to the central heating plants, underground piping and conduit work; and feeder system at Sing Sing Prison, Ossining, N. Y. Address inquiries to Lewis F. Pilcher, State architect.

NEW PUBLICATIONS

EMPIRICAL EQUATIONS OF THE SPEED AND TORQUE CHARACTERISTICS OF THE SERIES MOTOR is the title of a booklet prepared by A. S. Langsdorf, professor of electrical engineering at the Washington University. The author by means of curves and equations illustrates the method generally applied in determining the relations between speed, torque and current of series motors with due regard to the principles underlying the operation of all motors and to the mathematical representation of these principles. Equations of the speed and torque characteristics of a Westinghouse railway motor in the form of curves published by the manufacturer are shown. The booklet is reprinted from the Washington University Studies Vol. 6, Scientific Series No. 1 and will prove very helpful to the engineer.

AN INVESTIGATION OF TWIST DRILLS.—The Engineering Experiment Station of the University of Illinois has just issued Bulletin No. 103 entitled "An Investigation of Twist Drills," which has been prepared by Bruce W. Benedict and W. Penn Lukens. The bulletin is divided into six chapters, the first of which describes the purpose of the investigation of twist drills, undertaken primarily to solve certain problems relating to drilling which arose in the shops of manufacturers and elsewhere and to establish the facts relating to every day problems of shop practice. Methods employed and apparatus used in conducting drills, power tests of twist drills, tests to determine drill endurance, minor investigations and the conclusions arrived at are dealt with at great length. Five appendices are contained in the bulletin which deal with the development of the twist drill, drill grinding, lubrication of drills, drill testing and experiments of twist drills by other investigations, and includes much valuable information in regard to the twist drill, as well as many illustrations, curve drawings, etc.

FOREIGN TRADE

[*Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. ., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.*]

MOTORS, DYNAMOS, ETC. (27,314).—A company in England is in the market for direct-current, shunt-wound, second-hand motors and dynamos, as follows: One 1-horsepower, 220-volt, one 2-horsepower 220-volt, one 2½-horsepower, 220-volt, one 5-horsepower, 440-volt, one 7½-horsepower, 440-volt, one 10-horsepower, 440-volt, one 15-horsepower, 440-volt, and one 10-kilowatt dynamo, 220-volts, complete with slide rails and rheostat. All the above motors to be complete with slide rails, pulleys and starters. Quotations should be made f. o. b. New York or other United States port. Payment will be made by letter of credit. Reference are available.

ELECTRIC ENGINES, DYNAMOS, ETC.—A firm in Siberia, intending to establish an electric power plant, desires to purchase electric and steam engines, dynamos, armatures, etc. Quotations should be made f. o. b. Terms of payment will be cash. Correspondence should be in Russian.

Trade Activities

Westinghouse Receives Second Machine Gun Order—Electric Controller & Manufacturing Opens Three Agencies

Chicago Pneumatic Tool Company announces that contract has been let and work started on the erection of an up-to-date addition to its Cleveland plant, which is planned to double the present output. It is expected that work will be completed on the building about November first. The necessary equipment has been ordered and it is believed will be delivered and ready for installation by the time the building is completed, so that the additional production contemplated will be available very soon after.

Hughes Division of the Edison Electric Appliance Company, Inc., 5660 W. Taylor street, Chicago, has issued the latest edition of its catalog, covering the extensive line of Hughes products. It is attractively gotten up and includes many new editions to the Hughes line of electric ranges, ovens and appliances as well as older types carried by the company. Each item is described in detail, accompanied by splendid illustrations of these labor-saving devices. Every article offered by the Hughes Division is backed by the guarantee of this well known manufacturer, who has established a reputation for the production of dependable and properly designed appliances, insuring complete satisfaction and security as to material, workmanship and finish.

Electric Machinery Company, Minneapolis, Minn., has just published a very instructive bulletin (No. 189) entitled "Let's Make This Matter of Power Factor as Plain as A B C" and deals with the subject in a clear and comprehensive manner. The bulletin is intended to be an aid to three types of people, namely; those in charge of the power end of industrial plants generating their own alternating current supply, those connected with plants generating and wholesaling alternating current to the public or central stations, and those connected with the motive power end of industrial plants who buy their alternating current supply from a central station. The subject matter is arranged under three sections, Section A giving fundamental instructions to enable one to answer practical questions regarding power factors in his own plant. Section B is of particular interest to managers of isolated plants and to power customers. It outlines the advantages of high power factor, proper selection of motors and the desirability of installing synchronous apparatus wherever possible. Section C discusses advantages of high power factor from the standpoint of the central station, including fuel costs, overhead costs, metering, relation of rates to power factor, etc. The bulletin is well illustrated and contains numerous views of typical installations of synchronous apparatus and a partial list of companies using this machinery. Many diagrams in explanation of the subject are given.

Crocker-Wheeler Company, Ampere, N. J., is devoting its plant at present to practically 100 per cent war orders. The plant is working on a 24-hour basis, devoting the major part of operations to the manufacture of radio apparatus.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has received a second order from the Government for 30,000 Browning machine guns for the War Department. The company has recently completed an order of like amount of same type guns. At its East Pittsburgh works, employment is now being given to over 30,000 persons, the largest number ever registered on the company's payrolls at this plant. It is understood that the present payroll aggregates over $750,000 weekly.

Wirt Company, Philadelphia, Pa., has prepared a little folder describing the Wirt electric heating pad for distribution among local dealers. This folder is gotten up in a most attractive manner and illustrates clearly the great comfort radiated from this handy device. The Wirt pad is the result of several years' research, painstaking effort and thorough investigations of other pads on the market, and is one of the most efficient devices it is possible to obtain. It is so constructed that absolute safety is insured. The rubberized fabric of which it is made renders it impervious to moisture, the cause of most heating pad trouble, and eliminates the possibility of shock.

Sangamo Electric Company, Springfield, Ill., has just issued a 15-page bulletin (No. 48) dealing with Sangamo meters and their application to various storage batteries. After a wide experience in the manufacture of direct current watthour meters and amperehour meters of the Standard D-5 type, the company has developed and recently placed on the market a new type of amperehour meter known as Type "MS." Although much smaller than the D-5 type meter, it embodies all the details of design and construction which have contributed to the remarkable success of the Sangamo meters in central-station service and won their almost exclusive adoption by the United States Navy for use on submarines, battleships and other vessels where sustained accuracy and rugged construction to withstand the tremendous concussion of gun fire are of vital importance. The bulletin explains clearly the methods employed in charging storage batteries, battery losses, the principles of the mercury motor meter, and points out the salient features of this type of meter and its commercial applications. The booklet is profusely illustrated and contains numerous diagrams and curves together with much other valuable data.

Walter A. Zelnicker Supply Company, St. Louis, Mo., has recently added to its sales force Henry Stroh. For the past ten years Mr. Stroh was connected with the Elliot Frog & Switch Company, prior to which time he was associated with the Republic Iron & Steel Company, both of East St. Louis, Illinois.

Electric Controller & Manufacturing Company, Cleveland, Ohio, announces the opening of three new agencies on the Pacific Coast, O. E. Thomas, with headquarters in the Washington building, Los Angeles, having been appointed representative for the company in the southern portion of California. C. F. Henderson, with headquarters in the Call building, San Francisco, Cal., will represent the company in northern California, and W. Montelius Price, of Seattle, Wash., will act as its representative in the states of Oregon and Washington.

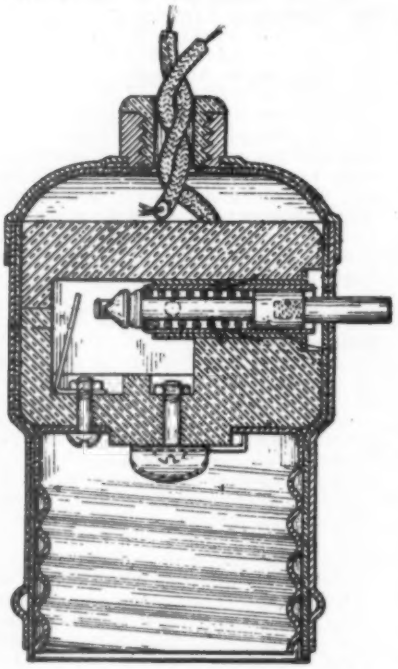
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is now distributing Catalog 1-B of wiring devices and carbon circuit breakers. This is a 224-page, 8½x11, catalog listing fuses, knife switches, service switches and boxes, solderless connectors, disconnecting switches, instrument switches, safety switches, safety panel boards, safety floor boxes, and carbon circuit-breakers, part of which have previously been listed in the old sectional 3001 catalog of the Westinghouse Company. An entirely new and complete line of knife switches of the Westinghouse Company's own manufacture, both front and rear-connected, the types A and C occupy 49 pages of this catalog. A new line of disconnecting switches, known as types P and R, are listed in this catalog for the first time. In listing the carbon circuit-breakers, the Westinghouse Company has made a departure from its previous practice. The carbon circuit-breakers are listed in this catalog according to what they will accomplish, that is, according to the method of operation, method of mounting, and their capacity, the type designation being the secondary consideration in the table of listings. On looking up the circuit-breaker to accomplish a particular duty, all that is necessary is to find from the cleverly prepared index, in the beginning of the tables, the particular table listing the breakers according to the operation and method of mounting desired, and then, in that table, follow down the list until the number of poles, the ampere, and the voltage capacity is found. A type designation is shown with this so that those wishing to know the details of construction of the breaker that will give their required operating characteristics, can easily find them on the pages of description.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Push-Button Switching Socket (1,269,611).—A single push-button projects from the side of this socket, designed by John E. Ketteman, of Toledo, Ohio. Pressing this inwardly closes the circuit, while a later lateral movement of the button releases it and allows a spring to open the circuit quickly.



No. 1,269,611.—Push-Button Socket.

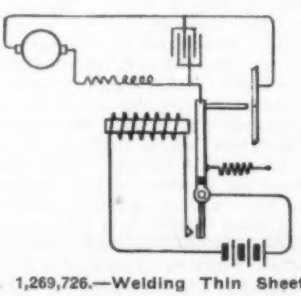
Making Calcium Carbide (1,271,229).—To make a high-percentage calcium carbide, Duke Robert Russell (of Chicago) uses coke from the pitch of completely distilled by-product coke-oven coal-tar, makes a conglomerate of this with lime, and inserts electrodes into this conglomerate in an electric furnace.

Combination Transformer and Circuit-Breaker (1,270,850).—William M. McConahey, of Pittsburgh, places the transformer and the switching apparatus in separate, oil-containing cases spaced a short distance from each other. Then he connects these cases by condenser-type insulating bushings through which the conductors are run.

Aerial Insulation Repairing Device (1,269,956).—To repair defective insulation on line wires without removing them from the poles or other supports, George T. Parr (of St. Paul, Minn.) places an insulating liquid in a receptacle hung from two wheels which travel on the wire, and mounts a rotary brush in this receptacle. After the wheels are on the wire, the device is compacted to press the brush against the wire, so that it will spread liquid on the latter.

Selective Motor (1,271,524). — A Wheatstone bridge with inductances and resistances in opposite sides is connected across a single-phase supply circuit leading to a motor which has one of its windings connected across the bridge while its other winding is connected directly across the supply circuit. These displaced windings have different time constants, so that the current in one will have its phase relation determined in greater degree by the frequency than that in the other winding. (Patent assigned by James Burke, of Erie, Pa., to the General Railway Signal Co.)

Welding Thin Metal Sheets (1,269,726).—In making electrolytic rectifiers, Ralph D. Mershon (the well known consulting electrical engineer, now of New York City) found difficulty in welding terminals to the exceedingly thin metal sheets. He therefore devised this method whereby one terminal of a charged condenser is connected to the two metal parts which are to be united, while rapidly recurrent blows are struck on these parts with the other terminal. The condenser is recharged between these successive blows, and as the spark of the discharge is concentrated at the point struck by the moving terminal, the welding heat is obtained without injuring other parts of the metal.

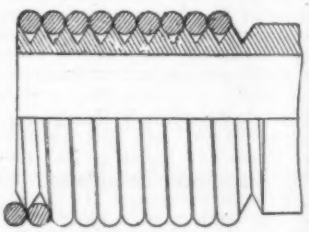


No. 1,269,726.—Welding Thin Sheets.

Rectifier-Equalizing System (1,270,805).—Where direct current is furnished to a single circuit by a group of rectifiers connected to a single source of alternating current, Charles L. G. Fortescue, of Pittsburgh, uses an auxiliary circuit inductively interlinked with the alternating-current connections of each of the rectifiers for maintaining a predetermined load distribution between the rectifiers. The patent was assigned to the Westinghouse Electric & Mfg. Co.

Revolving Fan (1,270,832).—Belting is used in this ceiling fan for rotating the support which carries the several fan motors, and means are provided for simultaneously adjusting the inclination of all of the fan motors. (Patent assigned by Oliver S. Jennings, of Wilkinsburg, Pa., to the Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.)

Protecting Conduit Threads (1,271,187).—A coil of wire is screwed upon the threads and is made of such pliable material that it will elongate and unwind when pulled lengthwise. (Patent assigned by George A. Lutz, of Cranford, N. J., to the American Circular Loom Co.)



No. 1,271,187.—Protecting Conduit Threads.

Circuit-Breaker (1,270,822).—A circuit-interrupter which will operate when there is an overload on the circuit, but which will not operate with a surge, is shown in this patent, assigned by Rudolph E. Hellmund (of Swissvale, Pa.) to the Westinghouse Co. For this purpose, he employs two cam members arranged so that they will permit the movable member to be operated when the overload has a symmetrical current wave, but will prevent such operation when the current wave is unsymmetrical.

Tungsten Lamps (1,270,843 and 1,270,856).—Anchored disks are used for supporting heavy filaments in the necks of the lamp bulbs according to these two patents, both assigned to the Cooper Hewitt Electric Co. of Hoboken, N. J. One was due to Frederick G. Keys and the other to Roy D. Mailey, both located at East Orange, N. J.

Latest Approved Fittings

The electrical fittings listed and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Conduit Boxes.—Appleton Electric Company, 212-14 N. Jefferson Street, Chicago, Ill.

"Unilets" pressed steel. Types A, B, C, D, E, LB, LF, LFM, LR, LBL, LU, LUA, RLR, T, TB, TM, TL, TR, X, XA, Series FS, FSW, G, GN, H, HM, MS, W, WD.

"Unilets" cast iron, Series WD.

Also above types with steel, composition, or porcelain covers, with or without bushings for wires.

Note: These boxes, if not entirely exposed, must be securely fastened in place independently of support afforded by conduit. In all cases covers and attachments must be exposed and easily removable.

Listed July 15, 1918.

Conduit Boxes.—Appleton Electric Company, 212-14 N. Jefferson Street, Chicago, Ill.

Pressed-steel conduit boxes. Catalog Nos. 3-OE, 3-RE, 4-ODD, 4-OE, 4-OEB, 4-OED, 4-OEDB, 4-OEDDB, 4-RE, 4-RED, 4-SCD, 4-SD, 4-SDD, 4-SE, 4-SEB, 4-SED, 4-SEDB, 4-SEDDB, 4-SSLD.

Wattmeter connection boxes, Types PRA, PRB, MTA, MTC, MTL, MTR, MTT, O-30 amperes.

For use with flexible tubing, Catalog Nos. 521-L to 524-L inclusive.

Also above types with steel, composition or porcelain covers, with or without wire bushings.

Listed July 16, 1918.

Cutout Bases, Cartridge-Fuse.—The Johns-Pratt Company, Hartford, Conn.

"Noark." Extension terminals for use in converting main-line cutout bases to double and triple-pole, two and three-wire, single and double-branch cutout bases.

30 and 60 amperes, 250 volts. Catalog Nos. 3436-45 inclusive.

For use only with this manufacturer's catalog Nos. 3325-30 main-line cutout bases.

Listed April 30, 1918.

Fixtures, Vaporproof. — Appleton Electric Company, 212-14 North Jefferson Street, Chicago, Ill.

These fittings consist of Unilets containing lamp receptacles with enclosing globes for lamps and outside metal guards.

Sizes: ½, ¾ and 1-inch. Series V, VH, VW, VHW.

Listed July 11, 1918.

Heaters—Electric Range. — Detroit Stove Works, 1320-80 Jefferson Avenue East, Detroit, Mich.

"Jewel Electric" range, 7.2 kilowatts, 110 volts.

Note: In installation of this device it is considered desirable, from standpoint of safety to persons, that framework be permanently and securely grounded, a soldering lug being provided on each device for this purpose. Same protection for surrounding materials should be observed in installation of these devices as is applied to stoves of other types used commonly for cooking.

Listed July 30, 1918.

Heaters, Miscellaneous. — Groton Electrical Devices, Inc., Groton, N. Y.

"Airdry," a heating unit and motor-driven fan enclosed in a cast-iron case and mounted on a cast-iron pedestal, to furnish a current of warm air intended to be used in drying hands or face. 15 amperes, 125 volts.

Note: It is considered desirable from standpoint of safety to persons that framework of this device be permanently and securely grounded, a soldering lug being provided for this purpose which should be used with suitable ground wire wherever grounding of device is not secured by means of properly grounded rigid conduit, armored cable or metal-raceway connection.

Listed May 18, 1918.

Lamp Adjusters.—Powers Manufacturing Company, 1931 Broadway, New York, N. Y.

Consisting of wooden pulley suspended from clamp attached to cord and of adjusting cord running over pulley and having its ends attached to a second clamp attached to cord near lamp socket. For use only with portable cord.

Listed April 30, 1918.

Metal-Raceway Fittings.—Appleton Electric Company, 212-14 North Jefferson Street, Chicago, Ill.

Fittings for use with "Pagrip" metal raceways. Catalog No. 105.

Listed July 16, 1918.

Outlet Bushings and Fittings.—Appleton Electric Company, 212-14 North Jefferson Street, Chicago, Ill.

Malleable-iron 45-degree conduit elbows. Catalog Nos. 8285-89 inclusive.

Listed July 16, 1918.

Outlet Bushings, Service-Entrance.—Appleton Electric Company, 212-14 North Jefferson Street, Chicago, Ill.

Types F and AY.

Listed July 16, 1918.

Receptacles for Attachment Plugs, and Plugs. — The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"C-H," 10 amperes, 250 volts; receptacles only. Catalog Nos. 7713, 7724, 7730, 7733, 7736, 7740, 7774; receptacles and plugs, Catalog Nos. 7714, 7725, 7731, 7734, 7737, 7741, 7755, 7775.

Listed May 25, 1918.

Receptacles, Medium-Base.—Pass & Seymour, Inc., Solvay, N. Y.

"P & S" porcelain shell.

Keyless, Catalog Nos. 4035, 4036, 4037, 61971.

Listed July 9, 1918.

Rosettes, Fuseless. — The Adapti Manufacturing Company, 919 West Street, Cleveland, Ohio.

"Adapti," 3 amperes, 250 volts, Catalog Nos. 565-B, 566-B.

Listed May 27, 1918.

Rosettes, Fuseless. — The Bryant Electric Company, Bridgeport, Conn.

"Bryant or Perkins Junior," Catalog Nos. 572, 573, 574, 575, 1710.

Listed July 16, 1918.

Signaling Systems. — Stromberg Electric Company, S. E. corner Erie and Franklin Streets, Chicago, Ill.

"Stromberg" electrically operated time-recording systems consisting of master clocks connecting to and closing electric circuits momentarily at given intervals for controlling a number of chronographs.

A. C. type. Storage batteries, relay, special transformer, hot-cathode rectifier for battery charging, and other auxiliary parts are used, depending on nature of supply circuit or number of instruments in installation. "Stromberg" 110-120 volts alternating current; 15 volts direct current.

Note: The safe use of this system depends in part upon proper fusing of all supply circuits. Standard 3-ampere fuses should be used. Inspection departments having jurisdiction to be consulted in all cases before installation.

Listed July 15, 1918.

Switches, Fixture.—Despard & Gordon Company, 557 W. Jackson Boulevard, Chicago, Ill.

"Brascolite No. 77."

Listed July 9, 1918.

Switches, Knife. — Albert & J. M. Anderson Manufacturing Company, 289-293 A Street, Boston, Mass.

"Anderson," all capacities, 250 volts, Type A.

Listed April 15, 1918.

Switches, Oil-Break.—Textile Machine Works, Reading, Pa.

Non-automatic, oil-immersed, drum contact switch designed for control of motors driving knitting machines.

Two horsepower, 250 volts, 60 cycles.

Listed May 18, 1918.

Switches, Surface.—General Electric Company, Schenectady, N. Y.

"G. E." ceiling switches.

Pull, single-pole, Catalog Nos. 211170, 211173.

Double-pole. Catalog Nos. 211172, 211175.

Three-way. Catalog Nos. 211171, 211174.

Listed July 12, 1918.

Men in Service

Ross B. Mateer Commissioned Captain—W. J. Grambs Appointed Supervisor Sea Training Bureau for Northwest

H. A. LOUWEIN, former secretary of the Danbury & Bethel Gas & Electric Company, Danbury, Conn., is now doing special work for the lumber division of the War Industries Board, with headquarters in Washington.

PROF. A. E. KENNELLY, acting head of the department of electrical engineering of the Massachusetts Institute of Technology, is in Washington for the summer engaged in special work for the Signal Corps.

LIEUT. FULTON MANDEVILLE, formerly of the commercial department of the Louisville Gas & Electric Company, Louisville, Ky., was recently promoted to the rank of captain in the 327th Machine Gun Battalion of the Lincoln Division.

ARTHUR M. ROSENTHAL, plant engineer and master mechanic of the Champion Engineering Company, Kenton, Ohio, is conducting a military night school for selective draft men. His work consists of training in automobile engineering as well as electrical engineering, and it is planned to take up other branches later.

LIEUT.-COL. PHILIP L. SPAULDING, president of the New England Telephone & Telegraph Company, has been promoted to the rank of colonel and has been assigned to the bureau of aircraft production with headquarters at Washington, D. C. Colonel Spaulding has recently returned from the western front, where he saw active service in the aviation section of the Signal Corps, having been in the army since October, 1917.

ROSS B. MATEER, formerly industrial engineer for the Southern Sierras Power Company with headquarters at Riverside, Cal., and more recently connected with the Philadelphia Electric Company, has been commissioned a captain in the Engineer's Reserve Officers' Corps, and is at present stationed at Camp Lee, Petersburg, Va. Mr. Mateer is widely known throughout electrical circles of the West, due to a very helpful series of articles compiled by him on electric pumping and reservoiring in agricultural districts of Southern California.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS has just published a handsome little booklet entitled "In the Service" devoted almost exclusively to members of the society now engaged in Government service. The service flag of this organization, which is reproduced in colors on the front cover page, bears 933 stars, each representing a member giving service in the earnest hope of making himself useful to his country and its cause. This is a record of which the society is justly proud and is indicative of the important part engineers of our country are taking in the great world war.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.

WILLIAM R. MORTON, secretary of the Alliance Gas & Power Company, has joined the army and is at present located at Hattiesburg, Miss.

H. E. ABEL, W. J. BACHMAN and W. H. BOYLE of the Arkansas Valley Railway, Light & Power Company, Pueblo, Colo., have entered the service.

A. L. MARTIN, manager of the Coos Bay division of the Oregon Power Company, Marshfield, Ore., has volunteered in the U. S. Engineering Corps, and expects to enter a training camp soon.

E. A. WILCOX, manager of the Public Service Company of Oklahoma, Tulsa, Okla., and formerly electric range specialist for the Great Western Power Company, has resigned to accept a commission as captain and is preparing for overseas service in the chemical warfare section.

SERGEANT JAMES J. KIRK, formerly illuminating engineer, contract department of the Commonwealth Edison Company, Chicago, is now with Headquarters Company, 41st Infantry at Camp Funston, Kans., where he has complete charge of all the electrical equipment from telephones to wireless and is getting in practice for trench warfare.

SOCIETY OF AUTOMOTIVE ENGINEERS in the August number of its journal records the following names of members who have entered Government service in civilian or military capacities: Military, C. M. Billings, A. Gray Churchward, Simon R. Dee, Allen A. Gould, Richard Kent, Victor W. Page, Dent Barrett, S. Ward Seeley, and T. W. Sheahan; civilian, William G. Brown, Charles W. Claaseen, F. Leroy Hill, Jr., Charles B. King, C. W. Lincoln, Arthur S. Mann, Charles C. Munson, A. W. Russell, Joseph E. Smith, Leslie V. Spencer, and William G. Weekley.

N. P. BRAY of the Sapulpa Electric Company, Sapulpa, Okla., has entered the U. S. Army.

J. M. DIXON, formerly with the Federal Sign System (Electric) at Louisville, Ky., is now connected with the Cincinnati office of the company.

WILLIAM KERKIS, G. PAYNE, JAMES MORRISON and J. S. ERWIN, all of the multiplex department of the Western Union Telephone & Telegraph Company at Los Angeles, Cal., have enlisted in the Signal Corps of the Army and have been assigned to the United States multiplex school of the College of the City of New York.

W. J. GRAMBS, formerly superintendent of light and power of the Puget Sound Traction, Light & Power Company, Seattle, Wash., was recently appointed supervisor of the Sea Training Bureau of the United States Shipping Board for the Pacific Northwest. Mr. Grambs entered Government service on September 1, 1917, since which time he has been in charge of the navigation schools of the Government in Seattle, Portland, Tacoma, Bellingham and the marine engineering school at the University of Washington.

HARRY D. MCBRIDE, who in civilian life was on the staff of the operating second vice-president of the Southwestern Bell Telephone Company, St. Louis, Mo., and in direct charge of welfare and industrial betterment work, has successfully passed the examination and has been commissioned a major in the Adjutant General's Department, National Army. He has been assigned to the commanding officer, Camp Taylor, Louisville, Ky., in the capacity of camp adjutant. Major McBride has been connected with the American Telephone & Telegraph and associated companies for over 24 years, having been stationed at Cleveland, Boston, Dallas and St. Louis.

JAMES M. SCHOONOVER, formerly with the Independent Telephone Companies, and first lieutenant of Company B (wire company) of the 310th Field Signal Battalion, which was in training at Camp Custer, Battle Creek, Mich., since early last fall, has had considerable experience in the telephone field. He was born in Ohio, December 8, 1892. After his graduation from the Rose Polytechnic Institute in electrical engineering, Lieut. Schoonover entered the telephone business in May, 1913, in the engineering department of the Citizens Telephone Company, the Wabash Valley Telephone Company and the Kinloch Telephone Company at Terre Haute, Ind., in whose employ he remained until responding to his country's call in July, 1917. He received his training at the officers' training school at Fort Leavenworth, Kans., after which he was assigned to training the men of whom he will have charge in maintaining the lines of communication overseas.

Personal

D. A. Hegarty Appointed Vice-President of Western Light & Power Co.—E. P. Dillon Joins Research Corporation

E. G. SHORE has resigned as local superintendent for the Mount Whitney Power & Electric Company at Porterville, Colo., to take charge of the electrical work of H. R. Parsons.

A. W. SIEMS has severed his connection with the firm of Zenker & Siems, to engage in the electrical engineering and contracting business for himself, with headquarters at 1358 Broadway, New York City.

ALFRED N. BARBER, secretary of the Board of Public Utility Commissioners, Trenton, N. J., is seriously ill at the Mercer Hospital, Trenton, suffering a nervous breakdown accompanied by complications. Miss Mary T. West, assistant secretary of the board, will act as secretary in the absence of Mr. Barber.

W. K. DUNLAP, assistant to vice-president of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been appointed general manager of the Westinghouse Electric Products Company, with which the Copeman Electric Company of Flint, Mich., has been merged.

WILLIAM P. GUINAN, new business manager, and Mayor Anthony Sunderland, cashier, of the Danbury & Bethel Gas & Electric Light Company, Danbury, Conn., have been appointed to a committee of 25 that will form a corporation to promote the industrial activity of Danbury.

G. F. COLLINS, formerly with Allis-Chalmers Manufacturing Company, New York, has become connected with the contract department of the Commonwealth Edison Company, Chicago, and is at present specializing on industrial illumination.

LEON C. WHITE, superintendent of the electric light and power department of the Twin State Gas & Electric Company, Brattleboro, Vt., was recently promoted to the position of superintendent of all departments of that company. Mr. White has been connected with the Twin State Company for 15 years, having entered its service as chief electrician in 1903.

E. P. CLIFFORD, eastern district manager of the Western Electric Company, has been appointed office manager of the engineering department at West Street, New York City. Mr. Clifford has been in the employ of the company since November 14, 1892, when he began as an office boy in the clerical department in New York. Shortly afterwards he became chief clerk and remained in that position until 1902, when he went to Chicago as chief clerk. He was transferred to Philadelphia in 1903 and a year later was back in Chicago doing clerical inspection work. After several years in that position Mr. Clifford became manages of the New York house and eastern district supervisor, and in 1917 was promoted to the position of eastern district manager.

D. A. HEGARTY, former vice-president and general manager of the Little Rock Railway & Electric Company, Little Rock, Ark., has been appointed vice-president of the Western Light & Power Company, with headquarters at Boulder, Colo., succeeding H. U. Wallace, resigned. Mr. Hegarty was born in Philadelphia and educated at the University of Pennsylvania. Leaving the university he became connected with the engineering department of the Pennsylvania Railroad as a rodman and passed through the various grades of the service until he was appointed assistant engineer of construction, also of the maintenance of way department of the Pennsylvania Railroad. He resigned from that company to become associated with A. Langstaff Johnston, pioneer electrical engineer in the railway field, in charge of the work of

D. A. Hegarty.

electrifying the railways in Philadelphia. Mr. Hegarty later accepted a position with the Norfolk Railway Company, from which he resigned to become manager of the Railways Company General, an operating and construction company, having railways, electric light and gas plants in Michigan, New York and Pennsylvania. Later he became vice-president, treasurer and general manager of the Little Rock Railway & Electric Company, and was transferred from this position to the managership of the railway and lighting departments of the New Orleans Railway & Light Company. Mr. Hegarty has taken an active part in the American Electric Railway Association, being formerly president of the Transportation and Traffic Division, and a member of a number of committees of the National Electric Light Association, and also of the Association of Municipal Improvements. In 1917 Mr. Hegarty was elected first vice-president of the Southwestern Electrical and Gas Association.

WILLIAM BENNETTS has been appointed electrical superintendent of the Western Light & Power Company, succeeding Harley Hard, resigned.

C. G. ALLENBACHER, former new business manager of Spokane Gas & Fuel Company, is now assistant purchasing engineer of the Doherty organization and located in New York.

H. H. HERMES, manager of the new business department of the Oklahoma Gas & Electric Company, Oklahoma City, Okla., has been appointed illuminating engineering administrator for the State of Oklahoma.

G. E. SCHULTZ, formerly associated with the Westinghouse Electric & Manufacturing Company in the industrial department, has become associated with Russell, Holbrook & Henderson, Inc., 30 Church street, New York, in the capacity of manager.

HOWARD F. VIOT, formerly manager of the Omaha district of the National Lamp Works, was recently appointed manager of the Chicago district of the Shelby Lamp Division of the company, with headquarters at 730 South Michigan avenue, Chicago.

A. L. DUNMIRE, for two years a member of the commercial department of the Elmira Water, Light & Railroad Company, Elmira, N. Y., has resigned his position to move to one of the suburbs of Chicago where he will engage in farming.

H. P. PITTS, commercial manager of the San Francisco district of the Pacific Gas & Electric Company has tendered his resignation to become purchasing agent for the Liberty Plant of the Bethlehem Ship Building Corporation, Ltd., which will soon be constructed at Alameda, Cal.

E. P. DILLON, manager of power division, New York office of the Westinghouse Electric & Manufacturing company, has resigned to become general manager of the Research Corporation of New York. Mr. Dillon came to the Westinghouse company in 1909, having been previously connected with various mining and electrical companies in Colorado. In 1917 he was transferred to the New York office as manager of the railway and power divisions. For several years he was assistant to manager of the railway and lighting department at East Pittsburgh, being in charge of power house and apparatus work. He was transferred to the New York office as manager of the railway and power divisions in 1917. Mr. Dillon has a host of friends who wish him success in his new position.

Obituary.

WILLIS L. BROWNELL, Manchester, Conn., formerly treasurer of the Crocker-Wheeler Company, Ampere, N. J., manufacturer of generators, motors, etc., died on August 11, at his home at Manchester, aged 72 years.

Financial News

Public Utility Concerns Will Finance Selves.

The public utility interests of the country, in need of $200,000,000 to meet maturities and finance expansion necessitated by the war work of the country, have tentatively agreed on the fundamentals of a scheme of financing themselves by the assistance of the Government through the War Finance Corporation.

Since Attorney General Gregory ruled that the formation of a giant financing corporation to loan money to the utilities and in turn borrow of the War Finance Corporation by rediscounting 75 per cent of collateral could not be practical because no single corporation could borrow enough to be useful, leaders among utility operators have been planning for the formation of a number of financing corporations.

It is now certain that the country will be divided into zones and a corporation created for each important section of the country. Although the same geographical lines may not be followed the division will be along lines similar to the zoning plan of the national public utilities committee. It is planned to have the capital of the various financing corporations vary with the needs of the utilities of the district.

A plan had been proposed for the formation of financing corporations to take care of the various groups of properties; that is a financing company would be formed to act as fiscal agent for all Byllesby properties, another would serve Stone & Webster properties, still another the Insull group. It was feared, however, that the weaker properties and small independent companies would not have an equal opportunity under this plan.

The public belief which persists that the utility companies will form the financing corporation and subscribe pro rata to its stock is in error. Although some of the richer utility corporations may subscribe in a large way to such corporate stock, the bulk of the work will be done by banks and bond houses which have specialized in the sale of utility securities. The utility companies have no money for such an enterprise. Had they the funds for such purposes they would not be asking for financial relief.

International Power to Reorganize.

A plan for reorganization has been prepared, which will include the formation of a new company to acquire most of the property. The new organization will authorize $250,000 first mortgage collateral trust 7 per cent notes, $340,000 notes bearing 6 per cent interest, $1,000,000 preferred stock, and 30,000 shares of common stock without par value. The notes are to be bought by a syndicate formed by George C. Van Tuyl, president of the Metropolitan Trust Company, F. H. Ray and J. G. Gray, the proceeds to supply new working capital. Depositors of old preferred stock are to receive 160 per cent of their holdings in voting trust certificates for new preferred at par, and owners of the common will get share for share of new common stock. The voting trust certificates for the preferred and common stocks are to be underwritten.

Cities Service to Offer Stock.

Henry L. Doherty & Company and Montgomery & Company have formed a syndicate to underwrite $6,000,000 convertible 7 per cent gold debenture bonds of company named in title. The bonds are to be offered to stockholders for subscription at 102½. The bonds are part of an authorized issue of $30,000,000, of which $3,000,000 was disposed of last March. The proceeds of the new offering are to be used in developing the company's oil land holdings in Kansas and Oklahoma. After January 1, 1920, the bonds will be convertible into Cities Service stock in proportion of 80 per cent of preferred and 20 per cent of common for each $100 par value of bonds.

Duquesne Light Note Issue.

The Duquesne Light Company has arranged for an issue of $10,000,000 in three-year 6 per cent gold notes. It is understood that an appropriation from this sum will be made for extensions and improvements in the company's plants and system, operating in the principal sections of Allegheny and Beaver counties, as well as at Pittsburgh. The company operates a 120,000-kilowatt electric plant on Brunot Island in the Ohio river, one of the largest and most important electric stations in the country.

An Obstacle to Utilities Credits.

In discussing the credits of public utility companies, Bradstreet's makes the following editorial comment:

"Attorney General Gregory's ruling that the law creating the War Finance Corporation limits its loaning ability to any one borrower to 10 per cent of the corporation's $500,000,000 capital, appears to have put a quietus upon the plans of the bankers who were about to organize a $100,000,000 pool to aid public utility concerns in need of financial assistance. The limitation in question would restrict loans by the War Finance Corporation to $50,000,000, or only one-half the amount of the proposed pool, and would be, in the opinion of the bankers who were interested in the project, an insufficient amount. Statements are current that the New York bankers' committee which had the matter under consideration may apply to Congress for an amendment of the law which would remove the obstacle, though it is uncertain whether such an application would be favored either by the Federal Reserve Board or the directors of the War Finance Corporation."

Earnings.

KANSAS GAS & ELECTRIC.

The Kansas Gas & Electric Company reports for June:

	1918.
Gross earnings	$ 150,582
Net after taxes, etc.	51,963
Balance after charges	20,318
For the 12 months ended June 30:	
Gross earnings	1,857,842
Net after taxes, etc.	565,816
Balance after charges	236,894
Balance after preferred dividend	103,894

CHICAGO, NORTH SHORE & MILWAUKEE.

Consolidated earnings for the twelve months ended May 31—Gross, $2,087,930, increase $737,854; net after taxes, $532,631, increase $134,190; total income, $538,846, increase $134,619.

NORTHERN OHIO ELECTRIC.

The Northern Ohio Electric Company reports for June and the six months ended June 30:

	Month.	6 months.
Gross earnings	$593,515	$3,468,309
Net earnings	209,329	1,242,601
Profits after charges	64,777	389,985
Balance after preferred dividend	34,777	209,985

COLUMBIA GAS & ELECTRIC.

For July—	1918.
Gross earnings	$ 789,709
Total net	532,151
Surplus	17,309
From January 1 to July 31—	
Gross earnings	6,884,824
Total net	4,681,489
Surplus	2,138,602

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate. Per cent.	Bid Aug. 13.	Bid Aug. 20.
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	6	14	13
Adirondack Electric Power of Glens Falls, preferred	6	68	68
American Gas & Electric of New York, common	10+extra	81	81
American Gas & Electric of New York, preferred	6	37	37
American Light & Traction of New York, common	..	187	185
American Light & Traction of New York, preferred	6	91	91
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	65	66
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	..	..
American Telephone & Telegraph of New York	..	91¾	96
American Water Works & Elec. of New York, common	..	4½	4¾
American Water Works & Elec. of New York, particip	7	12	12
American Water Works & Elec. of New York, first preferred	..	55	57
Appiachian Power, common	..	3	3
Appiachian Power, preferred	7	20	21
Cities Service of New York, common	+extra	210	210
Cities Service of New York, preferred	6	74	74½
Commonwealth Edison of Chicago	8	100	100
Comm. Power, Railway & Light of Jackson, common	..	22	22
Comm. Power, Railway & Light of Jackson, preferred	6	41	41
Federal Light & Traction of New York, common	..	7½	7
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	17	17
Middle West Utilities of Chicago, preferred	6	37	37
Northern States Power of Chicago, common	..	44	44¾
Northern States Power of Chicago, preferred	ex.div.7	79	79
Pacific Gas & Electric of San Francisco, common	..	34½	35
Pacific Gas & Electric of San Francisco, preferred	6	79	79
Public Service of Northern Illinois, Chicago, common	7	75	72
Public Service of Northern Illinois, Chicago, preferred	6	85	85
Republic Railway & Light of Youngstown, common	4	20½	20
Republic Railway & Light of Youngstown, preferred	6	59	57½
Standard Gas & Electric of Chicago, common	..	4½	4½
Standard Gas & Electric of Chicago, preferred	6	23	23
Tennessee Railway, Light & Power of Chattanooga, common	..	3	2½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	12½	14
United Light & Railways of Grand Rapids, common	4	29	29
United Light & Railways of Grand Rapids, preferred	6	61	61
Western Power of San Francisco, common	..	13	13
Western Power of San Francisco, preferred	6	48	49½
Western Union Telegraph of New York	extra	77½	80
Industrials—			
Electric Storage of Philadelphia, common	4	54½	54
General Electric of Schenectady	8	146	146
Westinghouse Electric & Mfg. of Pittsburgh, common	7	42¼	43
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	58	58

*Last sale.